

AN ANALYSIS OF SELECTED PRE- AND POST-ADMISSION VARIABLES AS  
THEY RELATE TO THE RETENTION OF NEW FRESHMEN AT A LARGE,  
RESEARCH, PUBLIC UNIVERSITY

A Dissertation

by

KRISS HOPE BOYD

Submitted to the Office of Graduate Studies of  
Texas A&M University  
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

May 2004

Major Subject: Educational Administration

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## ABSTRACT

An Analysis of Selected Pre- and Post-admission Variables as They Relate to the Retention of New Freshmen at a Large, Research, Public University. (May 2004)

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Texas A&M University changed the criteria for freshman admission after a legal decision in 1996 removed ethnicity from the list of possible admission criteria. The process now includes subjective criteria such as activities, leadership, service and awards as well as the traditional objective criteria such as test scores and rank in high school class. The purpose of this study was to analyze the relationship between some of the admission criteria and retention of freshmen from the first fall to the second fall. Retention of freshmen is a performance indicator for higher education in Texas.

The results of the logistic regressions showed that the relationships were modest at best and had a very small pseudo  $r^2$ . The objective criteria of test scores and high school rank were either not significant or did almost nothing to increase the odds ratio. The only variable that was significant in the regression, but had a modest odds ratio, across the regression for all students and for the regressions for the subgroups of female and male students, Anglo, Hispanic and Asian American students, and for students from targeted, disadvantaged high schools was parents' education level. The points assigned to students by

admissions counselors for self-reported leadership activities were significant for the regressions for all students, for female students and for Anglo students, but did very little to increase the likelihood of retention. Test scores were significant in the regressions for all students, for female students and for Hispanic students, but did almost nothing to increase the likelihood of retention. None of the variables were significant in the regression for the small group of African American students.

One conclusion from the analysis is that some students whose parents have the lowest levels of education and some students from targeted high schools have unmet needs that cause higher attrition rates for these groups. However, even within these groups, there are other factors driving the students' commitment to stay enrolled for the second year at the institution than those included in this study.

## DEDICATION

We continue to learn throughout our lives. Helping new college students learn is one of my passions. My parents, Lannes and Peggy Hope, provided the example through a home rich in love, curiosity, the arts, awareness of the world, and lively discourse at Sunday dinners. My older brother and sister, Brian Hope and Kerry Hope, led the way into higher learning. My husband, Dean, has been my partner in learning throughout my years in higher education. Taz, Java, and G.Q were my feline companions during many early morning hours of my doctoral work.

Life is what happens while you are making plans. Some doors close and others open. When I chose to open this door, my goals were to enrich my life, increase my knowledge in an area related to my profession, create new opportunities, and set a milestone for celebration. I dedicate this work to my family who gave me so much support.

## ACKNOWLEDGEMENTS

I must express special thanks to those at Texas A&M who have closely supported me through these years of doctoral study. Yvonna Lincoln was the first person in the department with whom I began discussing the possibilities. Carol Patitu was there when I started the writing process. Joe Estrada, Rita Caso, Larry Malota and Don Woods helped with the data. Frank Ashley and Homer Tolson were pinch hitters at the end and gave me confidence that this would be done. Bryan Cole steadfastly took on more than originally planned. Ben Welch was always there for moral support.

Sallie Sheppard provided professional support as I began my studies. Mark Weichold has helped me maintain energy and enthusiasm and has provided interesting new opportunities for professional growth. Sallye Henderson, Russ Graves, Sean Smith, Laura Wimberley and Andy Armstrong have made things work at the office during these last couple of years. Wanda Watson and Suzanne Droleskey have been fellow graduate students, valued colleagues and dear friends.

## TABLE OF CONTENTS

	Page
ABSTRACT.....	iii
DEDICATION.....	v
ACKNOWLEDGEMENTS.....	vi
TABLE OF CONTENTS.....	vii
LIST OF TABLES.....	ix
CHAPTER	
I    INTRODUCTION.....	1
Statement of the Problem.....	4
Purpose of the Study.....	7
Research Question.....	7
Operational Definitions.....	8
Assumptions.....	14
Limitations.....	14
Significance of the Study.....	15
Content of the Dissertation.....	16
II    REVIEW OF THE LITERATURE.....	17
Historical Context.....	18
Tinto's Cluster of Experiences.....	24
Independent Variables.....	50
Summary.....	86
III   METHODOLOGY.....	88
Choice of Variables.....	89
Data Analyses.....	95
Summary.....	96
IV   ANALYSES OF DATA.....	97
Research Question.....	97
Population.....	98

CHAPTER	Page
Descriptive Statistics.....	100
Logistic Regressions.....	130
Summary.....	142
V SUMMARY AND CONCLUSIONS.....	145
Research Method.....	146
Research Question.....	147
Summary of Findings and Conclusions.....	148
Research Recommendations.....	169
Recommendations for the Field.....	170
Closing.....	174
REFERENCES.....	176
APPENDIX A.....	191
APPENDIX B.....	192
APPENDIX C.....	193
VITA.....	194



## LIST OF TABLES

TABLE		Page
1	Gender and Ethnicity of Students Admitted With Review Points.....	90
2	First-semester Colleges for Students Admitted With Review Points.....	94
3	Gender, Ethnicity, Parents' Education Level, Targeted/Non-Targeted High School.....	100
4	One-year Retention Rates for Freshmen Sorted by Demographic Variables.....	102
5	One-year Retention Rates for Freshmen Sorted by Pre-admission Cognitive Variables.....	104
6	One-year Retention Rates for Freshmen Sorted by Pre-admission Non-cognitive Variables.....	105
7	One-year Retention Rates for Freshmen Sorted by Post-admission Variables.....	106
8	One-year Retention Rates for Freshmen Sorted by Gender and Demographic Variables.....	107
9	One-year Retention Rates for Freshmen Sorted by Gender and Pre-admission Cognitive Variables.....	109
10	One-year Retention Rates for Freshmen Sorted by Gender and Pre-admission Non-cognitive Variables.....	110
11	One-year Retention Rates for Freshmen Sorted by Gender and Post-admission Variables.....	112
12	One-year Retention Rates for Freshmen Sorted by Ethnicity and Demographic Variables.....	113

TABLE		Page
13	One-year Retention Rates for Freshmen Sorted by Ethnicity and Pre-admission Cognitive Variables.....	114
14	One-year Retention Rates for Freshmen Sorted by Ethnicity and Pre-admission Non-cognitive Variables.....	117
15	One-year Retention Rates for Freshmen Sorted By Ethnicity and Post-admission Variables.....	118
16	One-year Retention Rates for Freshmen Sorted By Parents' Education Level and Type of High School.....	120
17	One-year Retention Rates for Freshmen Sorted By Parents' Education Level and Pre-admission Cognitive Variables.....	121
18	One-year Retention Rates for Freshmen Sorted By Parents' Education Level and Pre-admission Non-cognitive Variables.....	122
19	One-year Retention Rates for Freshmen Sorted by Parents' Education Level and Post-admission Variables.....	123
20	One-year Retention Rates for Freshmen Sorted by Type of High School and Pre-admission Cognitive Variables.....	125
21	One-year Retention Rates for Freshmen Sorted by Type of High School and Pre-admission Non-cognitive Variables.....	128
22	One-year Retention Rates for Freshmen Sorted by Type of High School and Post-admission Variables.....	129
23	Correlation Matrix.....	131

TABLE		Page
24	Model of the Effect of Independent Variables on Retention of All Freshmen.....	134
25	Classification Table for All Freshmen.....	135
26	Model of the Effect of Independent Variables on Retention of Female Freshmen.....	136
27	Classification Table for Female Freshmen.....	136
28	Model of the Effect of Independent Variables on Retention of Male Freshmen.....	137
29	Model of the Effect of Independent Variables on Retention of Hispanic Freshmen.....	138
30	Classification Table for Hispanic Freshmen.....	139
31	Model of the Effect of Independent Variables on Retention of Asian Freshmen.....	139
32	Model of the Effect of Independent Variables on Retention of Anglo Freshmen.....	140
33	Model of the Effect of Independent Variables on Retention of Freshmen from Targeted High Schools.....	141
34	Classification Table for Freshmen from Targeted High Schools.....	142

## CHAPTER I

### INTRODUCTION

Autonomy and variety are defining characteristics of the growth of American universities (Bok, 1986). Bok believed that competition strengthened public and private institutions, and that the innovation and discovery generated through the support of a highly educated population was the most important national resource.

Higher education has become the key to admission to professional and paraprofessional careers, and the student population in higher education has begun to reflect the more diverse demographic characteristics of the general population. The number of students enrolled in degree granting institutions has grown from 12.5 million in 1986 to 14.8 million in 1999, and it is likely that enrollment in 2011 will be 17.7 million (National Center for Education Statistics, 2001a).

A combination of complex forces in the 1980's led to increased scrutiny of public education in the State of Texas, and the creation of performance indicators linked to appropriations (Texas Higher Education Coordinating Board, 2002; Droleskey, 2000). Two of the performance indicators have been the retention of first-year students and timely graduation rates. In response to both state and federal pressures, Texas A&M University set goals for

general retention and graduation rates, and for retention and graduation rates of African American and Hispanic students (Texas A&M University, 2000).

In 1997, Texas A&M University (Office of Institutional Studies and Planning, 2001a) began utilizing subjective admission criteria such as leadership, activities/awards, and community service in addition to the traditional selection criteria of SAT and rank in high school class in an effort to maintain the diversity of the incoming freshman class, and reflect its land grant mission to serve a representative population of the entire state. According to the Office of the Comptroller of Public Accounts for the State of Texas (1999), the population in the public schools in the 1996-97 school year was 12.1% African American and 29.1% Hispanic. In the fall of 2000, Hispanic and African American students comprised 9.8% and 19.6% of the students enrolled in four-year universities in Texas (Texas Higher Education Coordinating Board, 2002). Anglo students made up 58.4% of the enrollment. At Texas A&M University, 2.4% of the students were African American and 8.4% were Hispanic. The combined rate of 10.8% representation placed this institution thirty-fourth out of the thirty-five institutions that offered bachelor's degrees in the state.

In an evaluation of attendance patterns, retention, and six-year graduation rates of students who graduated from Texas high schools in the 1991-92 school year, Dowling (2000a) found that there were 162,270 graduates. Of these, 39,364 (23%) enrolled in four-year public universities,

and 33,767 (25.3%) enrolled in either community or technical colleges. Of the 44,195 Hispanic high school graduates, 8,074 (16.8%) enrolled in four-year institutions and 7,572 (22.8%) enrolled in community or technical colleges. Of the 19,820 African American high school graduates, 4,851 (20.9%) enrolled in four-year universities, and 3,474 (18.4%) enrolled in community or technical colleges. First-year retention within and across all state institutions was 86.9% for Anglos, 82.5% for Hispanics, and 73.8% for African Americans. Six-year graduation rates were 68.5% for Anglos, 57% for Hispanics, and 42.6% for African Americans.

The demographics of the state will change dramatically over the next thirty years (Murdock, et al., 1998). If patterns from 1980-1990 continue, by 2008 the population will be 45.9 percent Hispanic, 9.5 percent African American, and 36.7 percent Anglo. Public schools will be 70 percent minority in 2030. The potential college-going population will be 57 percent minority.

Murdock, et al. (1998) projected that the average Texas household in 2030 will be \$3,000 poorer in 2030 than in 1990. They presented data on college-bound Texas seniors to show that for every \$10,000 in household income there was an increase in the mean SAT. He concluded that Texas must improve the competitiveness of its minority students, increase their college-going rate, and increase their retention and graduation rates from universities or it will become a poorer and less competitive state. In a report by the State Coordinating Board of Higher Education (2000), it was noted that

the state already lags behind other large states. In the fall semester of 1999, only 4.9% of the state's population was enrolled in institutions of higher education, as compared to 5.6% of the state's population for New York and 6.1% for California.

### Statement of the Problem

The university in this study is a very large, Research I, public university. As a result of statewide scrutiny by the U.S. Office of Civil Rights, the university developed and implemented a plan to increase diversity at the university, with particular attention to the representation of Hispanic and African American students (Texas A&M, 1981). During the last decade, the retention rate from the first fall to the second fall for freshmen improved from 83% to 88% (Office of Institutional Studies and Planning, 2001; Office of Admissions and Records, 1997).

To create a more diverse student body, a university must both recruit and retain non-traditional students. However, in 1996 the Hopwood decision {Hopwood v. Texas, 78 F.3d 932 (5<sup>th</sup> Cir. 1996)} prohibited the use of race or ethnicity in the admissions process. The state's Attorney General provided an interpretation of that decision that expanded the restrictions to scholarships and retention programs. The number of African American freshmen enrolled as new freshmen at this institution dropped from 280 in 1995 to 177 in 1997

(Office of Institutional Studies and Planning, 2001). The number of new Hispanic freshmen enrolled dropped from 879 in 1995 to 593 in 1997.

State legislation passed in 1997 mandated that all students who ranked in the top ten percent of their high school class must be admitted to the Texas university of choice regardless of test scores or high school courses. This was designed to support diversity in the universities. Texas A&M also modified the system for the selection of applicants. This process remains relatively constant to the present and has resulted in a modest reversal of the drop in the number of minority freshmen (Office of Admissions, 2001a). Some students who were not top ten percent in rank were automatically admitted based upon a combination of very high test scores and a top-half high school rank. The remainder of applicants were evaluated and selected using a combination of objective and subjective criteria that include SAT or ACT scores, rank in high school class, leadership, extracurricular participation, service, talents/awards, employment, educational level of parents, legacy, other associations with the university, and extenuating circumstances (Office of Admissions and Records, 2001b).

The pool of qualified potential applicants from the Hispanic and African American community in the state was limited. According to data from the Texas Education Agency (2001), in May 1999 there were only 28,071 Hispanic and 15,064 African American seniors who graduated from high school and took either the SAT or ACT tests. Of these, only 3,088 Hispanic



and 1,175 African American students made above 1,110 on the SAT or 24 on the ACT. The mean SAT for the freshman class at Texas A&M for the Fall 1999 was 1 180 (Personal communication with D. Martin, Measurement and Research Services, April, 2001)

In the fall of 1994, there were 5,836 freshmen who were first-time, full-time freshmen at the university (Office of Institutional Studies and Planning, 2001). Of these, 88% of the Anglo students were retained to the second fall, and 75% were retained or graduated as of the fall of 2000. Of the Hispanic students, 81% were retained to the second fall, and 65% were retained or graduated as of the fall of 2000. Of the African American students, 82% were retained to the second fall, and 57% were retained or graduated as of the fall of 2000.

Retention rates gradually improved (Office of Institutional Studies and Planning, 2001). For freshmen who first enrolled in the fall semester of 1999, retention rates to the fall 2000 semester were 89% for Anglos, 86% for Hispanic students, and 83% for African American students. For freshmen who first enrolled in the fall semester of 2000, retention rates to the fall 2001 semester remained the same for Anglos, and for Hispanics and African Americans were 83% and 81%. For freshmen who first enrolled in the fall semester of 2001, retention rates to the fall 2002 semester were 91% for Anglos, 88% for African Americans and 84% for Hispanics.

One goal in the university's Vision 2020 report (Texas A&M University, 2000) was to increase the freshman retention rate from 88% to 95%, and to make retention rates for African American and Hispanic freshmen comparable to the entire class. As the university sought to improve overall retention rates and maintain diversity within the student body, the lower rates of retention for Hispanic and African American students became a concern.

### Purpose of the Study

The purpose of this study was to ascertain the predictive validity for retention of selected pre-admission and post-admission variables for freshmen who first enrolled at the university for the fall semesters of 1999 and 2000 who were admitted through the review process. The study provided the opportunity to examine the variables of SAT/ACT scores, rank in high school class, type of high school (targeted or non-targeted), points for service, points for leadership, gender, ethnicity, educational level of parents, on or off-campus residence during the freshman year, and initial choice of college for the freshman year. One research question was developed that incorporated all of the independent variables:

### Research Question

*1. What are the relationships between and among the pre-admission factors of gender, ethnicity, educational level of parents, high school type, rank in*

*high school class, SAT scores, level of involvement in leadership and community service, and post-admission factors of choice of college for the first semester, choice of residence on campus, and retention of freshmen at Texas A&M University?*

### Operational Definitions

Admission review (Initial) - Each application was reviewed by two admission counselors to determine a subjective score that was added to the objective score (Office of Admissions and Records, 2001a). If there was a substantial disparity between the scores awarded, a third review was conducted. After the distribution of all scores was evaluated, a preliminary cutoff score was determined. This score allowed room for some additional admission decisions to be made among those students immediately below that score in one last process.

Admission (High school by high school review) - This last stage of the admission process was what is called the high-school-by-high-school review. All applicants from the same high school were reviewed in rank order of their graduating class to make sure the decisions were consistent and justifiable within the high school. During this final round of review, certain high schools that had been identified as targeted or recruited high schools were reviewed as a subgroup. The designation of “targeted” or “recruited” was based upon data from Texas Education Agency, geographic location, and counselor

recommendation (Office of Admissions and Records, 2001b). By giving special consideration for students from these schools, the university reflected its land grant heritage of access for students from across the state, and attempted to maintain the diversity of each class.

Association with the institution – In the application, students reported enrichment activities or recruitment programs that the student attended at the institution, such as Summer Honors Invitational Programs. Students were assigned a score of 0-4.

Educational level of parents – In the application, students reported the parents' educational levels. Students were assigned a score of 0-6. The higher of the two parents' scores was used for this study.

Employment – Students reported their work history in the application. Based on the average hours per week worked and number of months employed, they were assigned a score. The more hours that the student reported having worked, particularly hours during the school year, the higher the student's score was on a scale of 0-9.

Ethnicity/race – Students reported their race/ethnicity. The options included White (not Hispanic origin), Hispanic, African American, American Indian, Asian or Pacific Islander, and Other. Students in this study could only check one of the options, and some students chose to leave all options blank. This information was not visible to admission counselors during the admission review process.

Extenuating circumstances - Students reported circumstances such as serious illness or traumatic family situations. Students were assigned a score of 0-9.

Extracurricular participation - Students reported activities and organizational membership during high school such as student government, scouting, and academic and non-academic competitions. Students were assigned a score of 0-6.

Freshmen – The students in the population were all students who were first-time, students at the institution in the fall of 1999 or the fall of 2000 who had not attended another university or college during a fall or spring semester since graduation from high school.

Initial college of the student - This is the college in which the student was enrolled for the first semester. Not all students were admitted to the college they listed as first preference on the application. Some were admitted to a second-choice college, and some who were not admitted to preferred colleges were placed in the General Studies major along with students who chose to declare General Studies. These students could attempt to change majors to the preferred college based on grades made during the freshman year. The colleges at the university included Agriculture and Life Sciences, Architecture, the Mays Business School, Education, the Dwight Look College of Engineering, Geosciences, Liberal Arts, Science, and Veterinary Medicine.

Leadership - Students reported leadership positions held during high school in the application. The students were assigned scores of 0-9 based upon leadership in school, local, regional, state, or national organizations.

Legacy - From 0-4 points were awarded, with one point for each immediate family member who was currently or had previously attended the university. Immediate family members included parents, siblings, and grandparents.

Objective score - Up to 32 points were awarded to a student in the admission review process based on the students predicted GPR. The predicted GPR is based upon performance of students in previous year's freshmen classes, and is derived from a formula that utilizes a combination of test scores and rank in high school class. Another 0-8 points were added that reflected the number of advanced high school courses taken. The maximum objective points that could be assigned were 40.

Parents' Education Level – This information is coded in two places in the Student Information Management System (SIMS). Admission Counselors hand posted scores of 0-6 on Screen 217 in SIMS, and a 6 indicated the lowest level of education. The Office of Institutional Studies and Planning posted data on Screen 288 in SIMS that was in most cases electronically scanned into SIMS from the application. Their coding system also utilized 0-6 points, but 6 indicated the highest level of education. For this study, data from Screen 288 was used, but it was cross-checked against data from Screen 217.

Pre-admission factors - Variables reported by all applicants and electronically stored by Texas A&M. These include SAT/ACT scores, rank in high school class, type of high school attended (targeted or non-targeted), points for educational level of parents, points for leadership, points for service, and total subjective points.

Post-admission factors - Two post-admission criteria evaluated in this study were place of residence (on or off campus) and choice of college.

Rank in high school class - The rank was the highest rank in class indicated on a freshman's high school transcript at either the end of the junior year or in January of the senior year.

Retention – Retention was the rate at which freshmen at the university return for a second fall semester. This retention rate was one of the performance indicators that must be reported to the state.

SAT/ACT scores - The score used was the highest total score for a freshman on either the SAT or ACT test. ACT scores were converted to SAT scores using a conversion chart from the Educational Testing Service.

Service – Students were awarded scores of 0-4 based on the service activities reported by the student on the application. These included activities such as mentoring, tutoring, food drives, holiday projects, and church projects.

Subjective score – This score was the total points awarded to a student in the admission review process from the categories of leadership, extracurricular

participation, service, talent/awards, employment, legacy, previous association with the institution, educational level of parents, and extenuating circumstances. The two reviewers' scores were averaged for a final score. The maximum subjective points that could be accumulated were 60.

Talent/Awards – Students were awarded a score of 0-9 based upon awards and talents self-reported by the student in the application. These included academic, artistic, and athletic awards, and awards such as Eagle Scout.

Targeted high schools – These were high schools that were identified through data from the Texas Education Agency as having larger percentages of disadvantaged students (Office of Admissions and Records, 2001b). The criteria included:

- Higher % of students in school with limited English proficiency
- Lower % of students in school who passed TAAS
- Higher dropout rates
- Lower % of students taking advanced courses
- Lower % taking college admission tests
- Lower mean ACT scores of those tested
- Higher % of students economically disadvantaged
- Lower average campus budget per student
- Geographic location with EPS Geo-markets.

Schools that were identified as targeted schools in either 1999 or 2000 were designated as targeted schools for the purpose of this study.

Total admission score - The total score included the subjective and objective scores awarded to a student in the admission review process. The maximum scores were 40 objective points and 60 subjective points.



Work - Students were assigned a score of 0-9 based upon their self-report on the application of the average hours worked per week and number of months employed.

#### Assumptions

1. Official records maintained by the university's Student Information Management System (SIMS) and the Office of Admissions and Records are accurate and complete.
2. Self-reported data such as ethnicity, leadership activities, extenuating circumstances, and educational level of parents are accurate.

#### Limitations

1. The research findings are limited to the participating large, research, public university, and generalizations to other universities will be limited.
2. This evaluation is being conducted on only the freshman classes from 1999 and 2000, and generalizations to freshmen in other years may be limited.
3. The impact of variables other than the selected pre-admission and post-admission attributes are not addressed.
4. The evaluations of applications conducted by the admission counselors are subjective, although the variability due to the subjective

nature of each evaluation is reduced by utilizing a mean score of two reviewers and a further review of disparate scores.

5. This analysis is limited to new freshmen at Texas A&M who enrolled in the fall semester of 1999 who graduated from high school in May 1999, and new freshmen enrolled in the fall semester of 2000 who graduated from high school in May 2000.
7. This analysis is limited to students who are admitted through the review process, and does not include those who are admitted as a result of being in the top ten percent of their high school class, or by having SAT scores above 1300.
8. Data may be categorized in a way that makes statistical manipulation possible, and conclusions will reflect group rather than individual characteristics.

### Significance of the Study

A stated goal of the university in a major planning report for the years 2000-2020 was that retention of students from the first fall semester to the second fall semester should increase from 88 percent to 95 percent. It is also a goal that the student body of the university more accurately reflect the population of the state. Retention of students is the result of the interaction of many complex variables, but it begins with the selection and admission of students who are most likely to survive and thrive in the environment provided

at the university during the freshman year. The admission system currently in place was created quickly in response to the *Hopwood* decision. Now that several years of data are available, an analysis of the *admission-review* system could determine the effectiveness of the inclusion of demographic, cognitive and non-cognitive variables in the selection and retention of a diverse freshman class.

#### Content of the Dissertation

An introduction, statement of the problem, purpose of the study, hypotheses, operational definitions, assumptions, limitations, and the significance of the study are provided in Chapter I. A review of related literature is provided in Chapter II. The methodology, including the population, instrumentation, and data collection and analysis procedures is described in Chapter III. The analyses of the data and the findings derived from the analyses are presented in Chapter IV. Conclusions, recommendations, and remarks from the researcher are presented in Chapter V.

## CHAPTER II

### REVIEW OF THE LITERATURE

In this chapter the literature on retention is addressed in three sections. An historical context to the review is provided in the first section. Literature relevant to the adjustment, difficulty, integration and isolation experiences identified by Tinto (1993) is provided in the second section. Literature related to the variables included in this study is provided in the third section.

Thirty years ago, the subject of college student attrition began to attract the attention of the academic community (Spady, 1970; Tinto, 1975). In the span of just one generation from the 1970's to the 1990's, the gap in income of high school and college graduates widened by almost 40% (Mortenson, 1995). Now there is intense scrutiny on retention. The scrutiny is not only from within academia, but also from the political arena. Resources have been focused on enhancing the preparation of public school students and increasing the completion of college degrees (Texas Higher Education Coordinating Board, 2000; Stephenson, 2001; Droleskey, 2000).

Students generally enroll in universities because they and their parents perceive that the completion of college degrees will add value to their lives (Astin, 1985; Tinto, 1993; Mortenson, 1995). In general, they reenroll because the costs and benefits balance out on the positive side, and their continued belief in that value has been maintained. It has taken thirty years to shed light on some, but not all, of the details behind those generalities.

The complexity of the retention issue has provided opportunities to analyze psychological phenomena, societal issues, economic perspectives, and organizational attributes (Braxton, Sullivan, and Johnson, 1997).

### Historical Context

Most discussions of the development of theories related to retention begin with Spady (1971). Spady borrowed Durkheim's existing theory on egotistical suicide that attributed some suicides to a lack of social integration, and he adapted it to a theory of college student attrition. Tinto (1975;1987;1993) modified Spady's attrition theory and presented it as a process. He observed that the majority of college students faced goal uncertainty, particularly during their first year of college. The task of adolescence was to move away from a dependence on parent-regulated self-esteem and self-definition and hopefully move toward mutually validating relationships and autonomous goals, and this complex task was an ongoing process during the college experience for students of traditional age (Lapsley, Rice, and Shadid, 1989; Pascarella, E., & Terenzini, P. ,1991; Terenzini, et al., 1994; Tinto, 1975; 1987; 1993).

Tinto (1975; 1987; 1993) hypothesized that during the transition to college, retention was the result of the match between an individual's background characteristics, motivation, and the new environment of the institution, or a sub-environment within the institution. A good match resulted

in academic and social integration. That integration solidified the student's commitment to remain at the institution and to complete a degree. He noted that retention resulted from the student deciding that the benefits outweighed the costs of that particular experience as opposed to other options outside of that college.

Astin (1975) found that past academic performance was the strongest predictor for persistence, followed by academic ability. When he controlled these he found that African American students were retained at the same levels, but retention for Hispanic students was lower. He also found that group affiliation could have positive or negative effects on retention. Astin (1984; 1985) later developed a theory of student involvement that connected areas of study. It proposed that the more physical and psychological energy a student invested in the academic experience, the more the university filled its responsibility of talent development. He stated that educational practice should be directly related to increases in student involvement and student time available should be considered a valuable resource of the university.

Bean (1980) added external factors such as ability to pay, finance attitudes, parental support, and peer support to the equation, drawing on the similarities between attrition and turnover in the workplace. He hypothesized that beliefs shaped attitudes, attitudes shaped behavioral intents, and behavioral intents were predictors of retention. He found that the five variables that contributed to attrition for men are Institutional Commitment,

University Grade Point Average, Satisfaction, Development and Routinization, whereas for women they were Institutional Commitment, Performance, Campus Organizations, Practical Value, and Opportunity to Transfer. Bean and Metzner (1985) expanded the theories to incorporate differences among traditional and nontraditional students. They found mixed results from researchers that measured social integration and its effects on persistence. They concluded that social integration might be replaced by support from the outside environment for nontraditional students. Pascarella, Smart, and Ethington (1986) utilized Tinto's model and determined that there were gender differences in the variables that had both direct and indirect effects on two-year students. They found that institutional commitment to the original institution at two-year institutions was negatively associated ( $p < .05$ ;  $-.116$ ) with degree completion.

Ferguson, Wisner, and Discenza (1986) proposed different categories of students based upon their desire to complete a degree. They identified Nonpersisters, Attainers, Stop Outs, Transfer Outs, and Dropouts, and suggested that they could be served differently by different retention strategies. Tinto (1993) noted that better data needed to be developed on involuntary attrition for academic dismissal, and voluntary attrition related to credential acquisition rather than degree completion. He observed that most evaluation has not distinguished between students who left because they met occupational requirements without a required graduation or students who left

because they entered higher education for reasons of personal learning rather than credentials.

Braxton, Brier and Hossler (1998) questioned the movement toward atheoretical studies of attrition which focused on identifying student's self-reported reasons for withdrawing. They hypothesized that it was easier for students to identify socially acceptable circumstances such as difficulties balancing work and school than it was for them to recognize and discuss issues such as the inability to operationalize a commitment to academic integration. They believed that the list of specific problems usually mentioned were only an influence from the margins of the bigger issues, and that the bigger commitment issues were based upon the student's perception that the value of attendance outweighed the costs of attendance.

Cabrera, Casteneda, Nora and Hengstler (1992) sought to determine whether Bean's or Tinto's model provided a better representation of the process. They found that Tinto's model had a greater number of hypotheses validated, whereas Bean's model accounted for more variance in Intent to Persist and Persistence because of the addition of the external factors. Cabrera, Nora, and Casteneda (1993) continued their study of the overlap between the theories. They found that overall the results supported the integrated model and the effect of environmental factors was more complex than previously believed. The environmental factors had an effect on socialization, academic experience, and goal commitment. The variables,



ranked by their effect on Persistence, were Intent to Persist, GPA, Institutional Commitment, Encouragement from Friends and Family, Goal Commitment, Academic Integration, Finance Attitudes, and Social Integration. Eaton and Bean (1995) applied theories of approach and avoidance behaviors and suggested that academic integration was a subconstruct of social integration and was therefore, more complex than previously thought.

Braxton, Sullivan, and Johnson(1997, p.112) identified 15 testable propositions from Tinto's original model. These were:

1. Student entry characteristics affect the level of initial commitment to the institution.
2. Student entry characteristics affect the level of initial commitment to the goal of graduation from college.
3. Student entry characteristics directly affect the student's likelihood of persistence in college.
4. Initial commitment to the goal of graduation from college affects the level of academic integration.
5. Initial commitment to the goal of graduation from college affects the level of social integration.
6. Initial commitment to the institution affects the level of social integration.
7. Initial commitment to the institution affects the level of academic integration.
8. The greater the level of academic integration, the greater the level of subsequent commitment to the goal of graduation from college.
9. The greater the level of social integration, the greater the level of subsequent commitment to the institution.
10. The initial level of institutional commitment affects the subsequent level of institutional commitment.
11. The initial level of commitment to the goal of graduation from college affects the subsequent level of commitment to the goal of college graduation.
12. The greater the level of subsequent commitment to the goal of college graduation, the greater the likelihood of student persistence in college.
13. The greater the level of subsequent commitment to the institution, the greater the likelihood of student persistence in college.

14. A high level of commitment to the goal of graduation from college compensates for a low level of commitment to the institution, and vice versa, in influencing student persistence in college.
15. A high level of academic integration compensates for a low level of social integration, and vice versa, in influencing student persistence in college.

They compiled the results of peer-reviewed literature to ascertain which of the fifteen propositions were supported by empirical evidence, including both multi-institutional and single institution studies. They split the findings related to each proposition into the areas of aggregated support, support by institutional type, and support by student group or subgroup. They ranked the support as strong, moderate, weak, no support, or no testing done for each of the propositions. Their analysis showed that in aggregated studies there was the strongest support for propositions ten and eleven, and strong support for two and twelve. In single institution studies, they found the strongest support for propositions one, nine, thirteen, fourteen, and fifteen. In multi-institutional studies defined by institutional type, they found that some of the propositions had not been assessed and of those that were, none received strong support across institutional types. In single-institutional studies defined by institutional type, proposition ten received the strongest support. Studies on commuter institutions provided strong support for proposition one and studies on residential institutions provided strong support for propositions five, nine, eleven, thirteen, fourteen, and fifteen. In studies that provided results on student groups, the only groups that they found had

been the subject of research regarding all of the propositions were males and females. For male, the ninth proposition received strong support. For females, only proposition fifteen received strong support. In regards to proposition three, there was strong support for Anglo men and women, moderate support for African American men, and no support for African American women. There was indeterminate support for all thirteen propositions for Native Americans, and no information provided about Hispanics. The authors noted the gaps that they identified did not necessarily reflect problems with Tinto's theory. They reflected opportunities for continued research.

#### Tinto's Clusters of Experiences

Tinto (1993) identified four clusters of experiences that influenced student departure. These were social/intellectual adjustment, difficulty, integration and congruence, and isolation. These clusters were stages in the developmental journey. As with many aspects of development, some students progressed through these stages in a linear fashion, while the progress of others reflected loops, combined issues, or reverses in progress.

#### *Social/Intellectual Adjustment*

The first cluster was adjustment, both socially and intellectually. Universities and programs that retained students demonstrated a commitment

to the academic and personal development of each student. The universities were committed to the education of the student, not just to retention. They also demonstrated a commitment to provide integrated social and academic communities that nurtured new students and provided individual connections (Tinto, 1993; Noel, Levitz, Saluri, and Associates, 1985; Astin, 1985).

Pascarella and Terenzini (1991) grouped all of the theories of college student change into two categories. The first included those that described developmental dimensions addressed mostly in psychological developmental theories. The second category included theories that incorporated environmental or sociological origins of change, particularly between-and-within-institutional effects on change or development. Within this category, they identified physical models, human aggregate models, and perceptual models.

Among the physical models, Barker and Associates (1987) theorized that environments affected individuals similarly despite individual differences and the level of influence was determined by the number of people involved, the tasks, and the size of the setting. Holland's (1985) theories provided an example of human aggregate models. In addition to delineating six individual or environmental types, Holland theorized that individuals sought out environments that allowed them to play what they perceived as desirable roles. He believed that when there were inconsistencies between the individual and environment, change would occur. This change was most

likely to be demonstrated by an individual moving from one environment to another that appeared more congruent with individual characteristics. Among the perceptual models, Stern (1970) theorized that the balance between individual needs and the press of the environment resulted in satisfactory or dissatisfactory need resolution.

Baker, McNeil, and Siryk (1985) studied the difference between expectations and perceptions of the college environment for entering freshmen. They concluded that entering students are more accurate at making predictions based upon self-knowledge rather than on an unknown environment.

Yet, when a freshman entered college, self-knowledge issues were in transition (Lapsley, Rice, and Shadid, 1989). Lapsley, Rice and Shadid compared separation-individuation of students at a large, private Midwestern university. They found that freshmen, noted more psychological dependencies on parents than did upperclassmen, whereas upperclassmen had more conflictual dependencies with fathers. Among freshmen they also found that variables related to psychological separation from the mother were more predictive of college adjustment than from the father. Freshmen had poorer social and personal-emotional adjustment. Women showed more dependencies than men, but it did not appear that women's dependencies limited their college adjustment. Psychological separation was a predictor of academic adjustment for upperclassmen but not for freshmen, probably

because the freshmen had not yet had much academic feedback. There was variation across both populations and the authors concluded that the separation task was not resolved in college students.

Larose, Robertson, Roy, and Legault (1998) analyzed nonintellectual learning dispositions and found that the dispositions explained 5% to 10% of the variance in academic achievement above that explained by high school rank and a measure of aptitude. They found that rational and realistic beliefs, adaptive academic and social behaviors, and the ability to control anxiety during tests contributed to academic success across cultures and regardless of predicted success. McKean (1994) observed that students who attributed academic setbacks to factors beyond their control, who pessimistically blamed themselves as being unable to control the tasks, became more likely to believe they could not control future tasks. Pascarella, Edison, Hagedorn, Nora, and Terenzini (1996) found that students made more gains in developing an internal locus of attribution at two-year institutions than at four-year. They observed that teaching skill, teaching clarity, and teacher support contributed to that development.

McGrath and Braunstein (1997) collected data on freshmen who met requirements academically to continue to the sophomore year at a small northeastern private institution. They found that only first-semester grade point average and students' initial impressions of other students were significant predictors. They concluded that student impressions of other

students were influenced by other academic and financial considerations. Students who had academic or financial problems were less likely to have time available to participate in activities and interact with classmates. Anaya and Cole (2001) found that work hours had a stronger impact than either parent's education level or motivation related to a degree plan. Eaton and Bean (1995) found through their multiple regression and LISREL analysis that social and academic integration were interrelated and that social involvement could have statistically significant positive or negative effects. They believed their findings were consistent with previous findings (Pascarella and Terenzini, 1991) that students enhanced their academic performance when they had social interactions with good students and that some students who avoided academic stresses by socializing showed social gains.

Pascarella and Terenzini (1991) documented that some institutions have provided the opportunity for more interaction between new students and faculty. The literature generally has supported the conclusion that contact between new students and faculty can enhance cognitive development. Anaya and Cole (2001) used data from the College Student Experiences Questionnaire (CSEQ) to evaluate the impact of various types of student/faculty contact on academic performance of Hispanic students. They found that informal contact with faculty was of minimal value, but faculty contact with an academic focus was more likely to contribute to a student's

academic performance. This was consistent with Pascarelli and Terenzini (1978).

For some non-traditional students, the separation was more intense and the transition more difficult (Riehl, 1994). Riehl conducted a study of first-generation college students at Indiana State University. Of the 2,190 entering freshmen who participated in the university's orientation program, 774 were identified as first-generation students. The first-generation students entered with lower test scores and grades from high school. Their rank in class showed no significant difference, probably due to attendance at less competitive inner-city or poor rural high schools. The first-generation students had lower expectations regarding first-semester grades and intent to complete degrees, and subsequently were less successful during their first year. Terenzini, et al. (1994) found that first-generation students differed from their peers in both background characteristics and college experiences. They were more likely to come from low-income families. They were more likely to have weaker cognitive skills, gained less in reading comprehension skills during the first year, and were less likely to see faculty as supportive. They also worked more hours off-campus. Anaya and Cole (2001) found that for Hispanic students work hours had a stronger impact than either parent's education level or motivation related to a degree plan.

Terenzini, et al. (1994) interviewed new students at four different types of institutions. These were a southwest community college, a small,



residential liberal arts college, a midwestern, urban state university, and a large, eastern research university. They found that traditional students believed the biggest challenge was social adjustment and peer group relations. College was an expected rite of passage. Nontraditional students often saw going to college as a major disjunction in the course of their life as compared to their parents and relatives, and going to college involved transitions in academic, social, and cultural domains. Having high school friends enter college together provided a bridge for some students. However, maintaining contact with high school friends who did not go to college complicated the transition. For most students, entering college included elements of personal redefinition. For some of the nontraditional students, the transition required a redefinition of self. The authors recounted stories from nontraditional students of how the experience of separating was especially bittersweet for parents who were proud, but who realized that their child may never come home again. Crawford (1966) tracked 790 high school seniors in a low-income and highly agricultural county to determine the relationship between attachment to family, psychological and economic support from the family, and plans to migrate. He found that the students with high attachment to the family were less likely to migrate than those with low attachment. However, with support from the family they were more likely to migrate.

Grayson (1997) found that first-time, full-time freshmen at a large Canadian university who were from families without a university-educated parent were not at a disadvantage in regards to their GPA's compared to peers. These students spent fewer hours on campus and spent less time at cultural events which in some situations contributed to higher grades. They were also less involved in some activities and club involvement that contributed to lower GPA's.

Rowser (1994) administered a Freshman Survey to students entering a midwestern university. Before the freshman year, 91 percent of African American and 96 percent of the Anglo students believed they were adequately prepared for college academics. After the completion of the freshman year the numbers dropped, with 85 percent of African American and 88 percent of the Anglo students indicating they felt prepared. The need for assistance with self-confidence was similar across both groups and did not change significantly after the first year. Those indicating a need for assistance with self-discipline more than doubled, with the rate for African Americans moving from 24 percent to 52 percent and the rate for Anglos moving from 14 percent to 35 percent. More students indicated a need for help with time management after the first year. The percentage of African Americans increased from 36 percent to 52 percent and the percentage for Anglo students increased from 44 percent to 50 percent. Kraft (1991) also found that African American students frequently mentioned the issue of

discipline. Among these students the concept of discipline included the ability to estimate the impact of particular assignments on final grades and the ability to pace one's self. Many males mentioned ability as a factor, but females were more likely to mention supportive faculty, students, and parents, and self-confidence. Of the female students, 93 percent said that social support was an important factor that contributed to their academic success compared to 60 percent of the males. Because of the small number of African American students, new African American students found themselves welcomed into the African American community. However, some met with disapproval when their circle of friends included Anglo students. Rowser (1994) found that there were increases in the students' perceptions of their personal and social preparation during the freshman year. The increases were small, but among this group twice as many African Americans as Anglos felt less than adequately prepared. Among African Americans there was a significant shift from indicating preparation as very adequate to just adequate.

Hurtado, Carter, and Spuler (1996) analyzed data from the Student Adaption to College Questionnaire completed by Latino students who were top PSAT scorers who entered four-year colleges in 1991 and who completed The National Survey of Hispanic Students. In open-ended questions, the students mentioned the most difficult aspects of the first year were the levels of academic difficulty, the amount of work, new performance standards, social and family relationships, managing time, and a climate that included

inequality. When asked where they got the most support, they mentioned peers, upperclass students, residence hall staff, friends, and family. The authors found that climate-related minority-status stressors were present and included overt and subtle experiences.

### *Difficulty*

Tinto's second cluster included elements of difficulty (1993). When students moved into the new college environment, they experienced difficulties in personal and social domains. Laspley, Rice and Shadid (1989) discussed how the transition to college often involved personal difficulties related to separation from the family unit. Rice (1992) concluded that women with disengaged relationships with their fathers and conflicted relationships with their mothers could have adjustment difficulties during this time. For men, the relationship between the student and parents, particularly the father, took on more importance during the junior year. Rice speculated that the career-establishing steps of the junior year could provide some explanation. Campbell, Lopez and Watkins (1988) concluded that the psychological separation patterns of male and female students were differentially affected by inappropriate family structures. They found that women could be especially drawn into dysfunctional roles as a result of the need to maintain parental approval. Marital distress among parents was more closely

associated with conflicted, distant relationships between male students and their parents.

Bowen and Bok (1998) and Orfield (1989) found that students from predominantly minority schools were not exposed to the same level of curriculum that exists in predominantly white schools. Pennock-Roman (1990) concluded that for Hispanic students overprediction of freshman grades based upon high school grades seemed to be best explained by the less competitive environment of predominantly Hispanic high schools. Boyd (1999) found that reasons that were identified by and for a group of 298 students at a large, public, research university who had experienced academic difficulty fell into the categories of personal or personal health problems, family or family health problems, personal financial problems, family financial problems, lack of study and time management skills, and a mismatch between student skills and courses selected. The most frequent problems were the lack of study and time- management skills, and a mismatch between skills and courses selected. African American and Hispanic students were more likely to have experienced the greatest number of problems and problems that were more profound. The mean rank in the high school class was the highest for the African American students, followed by the Hispanics and then the Anglos. African American students had the lowest SAT scores, Hispanic students were in the middle, and Anglo students had the highest scores. African American and Hispanic students were more

likely to come from high schools that had the lowest rank on the statewide academic skills exam. Only one of twenty-two African American and two of fifty Hispanic students came from high schools with the highest rank.

Of those students who left college, Tinto (1993) noted that many were involuntary because of academic dismissal. He observed that some students thrived socially but did not adapt to more rigorous academic demands or did not have adequate academic preparation. He thought it was ironic that when the student was at the highest risk during the freshman year and could benefit the most from personal contact with other students and faculty, the first year was often structured in a way that inhibited interaction, particularly the interaction that nurtured academic growth.

Rowser (1994) found that after the first year, both Anglo and African American students at a midwestern university had GPA expectations that still remained unrealistically high. When asked how long they thought it would take to complete their degrees, significantly fewer Anglo students believed it would take more than four years to graduate. Even though more African American students thought it might take longer, none thought it would take longer than five years. Hurtado (1994) determined that the relationship between student background characteristics and academic self-concept development was less clear among Hispanic students.

Another challenge new students faced was determining an appropriate major (Pennock-Roman, 1990; Peterson, 1993,; Seymour and Hewitt, 1994).

Kramer, Higley, and Olsen (1994) found that prior to enrollment in college, 75-80% of students selected a specific academic field for a major. Many changes of major resulted when students made a decision without sufficient information, but many were also made because students experienced academic difficulties. The authors found that between 1980 and 1988 at Brigham Young University, the percent that remained in the same academic field at the time of graduation that they declared on their application ranged from 45-56%, and most major changes were to different colleges. From 27% to 45% changed majors once, and 22% to 31% changed twice. Simpson (1987) found that 49% of the students who indicated a preference for a specific academic area at Michigan State University changed majors, and 13% changed twice.

Anderson, Creamer, and Cross (1989) compared students who decided and stayed in a major, students who changed majors multiple times, and students who initially chose to not declare majors. They found that the students who changed majors multiple times actually had the greatest retention (71percent), and students who never changed majors had the least (23 percent). This may have been more attributable to other characteristics of the students who changed majors. *Students* were more likely to be full-time and residential, and less likely to be employed. The students who did not change majors had the highest GPA, the undecided students were in the middle, and the students who changed majors had the lowest GPA.

Healy (1991) found that older students were more committed to a career choice which resulted in higher academic achievement. Luzzo (1993) found that students who were more committed to a career decision were less likely to have anxiety about the decision. Gloria and Hird (1999) found that Anglo students had higher career decision-making self efficacy and lower trait anxiety than minority students, and that the variables of ethnic identity and other-group orientation accounted for a larger part of the variance in career decision-making self-efficacy and trait anxiety for minority students. Peterson (1993) found a strong positive relationship between career decision-making self-efficacy and social and academic integration among underprepared students at a large urban university. The effect was consistent across genders and ethnicities. Peterson suggested that the results were consistent with other studies and recommended that colleges should focus on prevention of attrition through institutional programming that will assist students who have not yet defined specific career goals.

Some majors placed more academic demands on freshmen than others, particularly science and engineering majors (Pennock-Roman, 1990; Seymour and Hewitt, 1997). Seymour and Hewitt interviewed over 300 students in science and engineering majors at seven different universities. All of the students had good enough academic backgrounds to survive in the majors, but many left. They could determine no differences in the characteristics of students who remained in the majors and those who left.



Students in both groups talked about the difficulty of the majors, and how it seemed the professors made them more difficult than they had to be at times. Many who remained did so because at the time when they were most discouraged they got some encouragement. However, the lack of professors who were available for advising and mentoring was a common element across institutions, and continued even at the upper levels. Some schools had student support groups such as Women in Science and Engineering, the Mexican American Engineering Society, and Black Engineers, and students at schools with such programs felt they benefited from the support.

Pennock-Roman (1990) studied Hispanic students from two very selective and four moderately selective universities. The mean SAT score for the students was 135 points higher than the national norms for Hispanics. She found that the grade point ratios for the students were overpredicted by SAT scores and high school rank. However, she found that Hispanic students were overrepresented in majors that were considered particularly difficult such as the sciences, engineering, or mathematics. When she controlled for college major, the overprediction was greatly reduced.

The disciplines that placed greater demands on freshmen tended to do so with tougher grading practices as well as heavy workloads (Strenta and Elliot, 1987). The authors documented differential grading practices in academic areas that did not seem to be explained by differences in student ability. They claimed that because of the differences in grading practices, the

SAT appeared to have weaker validity in predicting grades. However, by using the students' SAT scores, they were able to highlight differences between such areas as anthropology, sociology, and economics. They also demonstrated that majors that attracted students with higher SAT scores had more difficult grading standards. Elliot and Strenta (1988) expanded their original study of psychology majors and found that adjusting the grades to reflect differing grade standards did improve the predictive ability of the SAT, and particularly improved the predictive ability for African American students.

Braxton, Olsen and Simmons (1998) evaluated differences in pedagogical practices between professors in different disciplines that he categorized as hard paradigmatic and low paradigmatic. High paradigmatic fields such as the sciences had a high level of agreement about theory and methods. Low paradigmatic fields included areas such as social sciences. He found differences in four of seven practices that were considered principles of good teaching. High paradigmatic fields were less likely to incorporate the principles in their classroom practices.

Pascarella, Edison, Hagedorn, Nora, and Terenzini (1996) found that grading practices varied across types of institutions and across classes with different class sizes. They concluded that students made more gains toward internal attribution if they were enrolled in two-year rather than four-year institutions. The differences appeared to be related to teacher behaviors that included organization and preparation, teacher instructional skill and clarity,

and teacher support. Anaya and Cole (2001) found that students at research universities tended to have lower grades than students at comprehensive colleges. Boli, Katchadourian, and Mahoney (1988) evaluated grading practices at Stanford University for the purpose of the application of their analysis to administrative issues related to changing patterns in major selection. There was an increase in students selecting science and engineering majors, but the students were including increasing numbers of humanities and social science courses in their degrees. They found that the mean grades ranged from 3.51 in humanities courses to 3.21 in engineering courses, which was a statistically significant difference. They found that most statistically significant differences for male and female grades were for those students enrolled in science courses, followed by students enrolled in engineering courses. They could not find any traditional academic predictors such as amount of high school math classes, self-confidence in math that explained differences in persistence in the courses. They then confirmed that the class size had a robust and consistent effect on mean grades for all academic areas, although specific data was not provided regarding significance. When comparisons were made across disciplines that took the class size into account, the difference in the mean grades was reduced to 3.45 in humanities to 3.33 in engineering. Braxton (1993) evaluated final examinations in the four disciplines of biology, chemistry, history and sociology from a range of selective universities. He found that the exams

from the universities that had more highly competitive admission processes did not reflect a higher level of critical thinking or academic rigor. He suggested that this was because faculty behaviors were more focused on meeting the demands of their disciplines, they were not experts in test construction, and that the development of critical thinking happened more often as a result of the classroom experience.

Course-taking patterns generated differences in the grades of students (Szafran, 2001). Szafran found that when students were registered for more hours, they tended to have higher grade point averages and retention, but when they registered for more difficult courses, those with a higher percentage of D's and F's in the grade distribution, they had lower grade point averages and retention. He noted that it was erroneous to jump to the conclusion that students should take more hours because students who took more hours and made higher grades may have been more confident in their academic ability and may have had fewer outside demands on their time. Bean and Bradley (1986), and Pike (1991) also found that course difficulty had a negative effect on the grade point averages of students.

The classroom environment had an impact on students' ability to absorb difficult material (Pounds, 1989; Kraft, 1991). These authors observed that African American students often faced a particular challenge of sorting through a student-teacher environment that could be perceived as unfair or unresponsive based upon what seemed to be racial cues. There were few

minority faculty, particularly at large research institutions. Anaya and Cole (2001) found that Hispanic students benefited from faculty contact that had an academic focus.

Solomon and Wingard (1991) reported descriptively that there were fewer African Americans who received Ph.D.'s in 1987 than in 1974. Of all doctoral degrees awarded in the U.S. in the 1999-2000 academic year, just less than five percent were awarded to African American students, slightly over five percent were awarded to Asian American or Pacific Islanders, three-tenths of a percent were awarded to Native American or Alaskans, and slightly over three percent were awarded to Hispanics (American Council on Education, 2002). In all U.S. colleges and universities in 1999, five percent of the faculty were African American, five percent were Asian American or Pacific Islanders, one half of one percent were Native American or Alaskan, three percent were Hispanic, and eighty-five percent were Anglo (National Center on Postsecondary Education Statistics (2001b).

### *Integration and Congruence*

Tinto's (1993) third cluster of experiences consisted of those elements related to integration and congruence. Those students who met the academic requirements to continue had to feel that the environment and experiences provided by the institution were personally beneficial and worthwhile. Congruence was enhanced by the choice the student

demonstrated in selecting an institution. That choice was influenced by the student's perception of the communicated institutional mission. Tinto (1993) emphasized that a university must reflect on the nature of students it wished to retain as part of the development of the mission. He stated that in some situations, recruitment and retention of one type of student could reduce the institution's effectiveness with another population.

Utilizing data from the Student Information Form from the Cooperative Institutional Research Program, Tinto (1993) found that students were most likely to be retained when they had both the commitment to complete a degree and they had a commitment to the institution (Tinto, 1993). Pascarella and Chapman (1983) and Bean (1980), utilizing path analysis of data from student information instruments, found that institutional commitment was the strongest direct influence on student persistence. They also stated that while social and academic integration did not have a direct affect on persistence, they did have a direct influence on institutional and goal commitment, which had an influence on persistence. These findings were duplicated by Beil, Reisen, Zea, and Caplan (1999) at a residential, private, research university. Braxton, Brier, and Hossler's (1988) findings provided additional support for the contention that institutional commitments outweighed the personal, psychological, or financial costs associated with college attendance. Utilizing multiple regression analysis, they found that it was the variables that influence ongoing commitment that held distinct value for each student.

Students who enrolled in two-year colleges were more likely to persist if they had high levels of commitment to complete a degree and commitment to the institution (Mutter, 1992). Mutter determined that social integration had little effect in the two-year setting, but academic integration and the support of others were important. Willner (1982) determined that students who were undecided or vague about career goals were more likely to withdraw from community college than those who had decided on a specific career. On the other hand, Tinto (1993) cited several sources to support his conclusion that periods of temporary indecision were normal for college students and did not appear to be a cause of attrition.

Pascarella, Smart, and Ethington (1986) evaluated progress over nine years of a nationally drawn sample of 825 students who first enrolled in two-year institutions. They found that the students were more likely to complete a bachelor's degree if they felt they were socially and academically integrated into the four-year institution in which they completed their degrees. One interesting finding was that for men the commitment to the initial institution had a negative effect on degree completion. The authors concluded that post-admission experiences at the four-year institution were as important as pre-college characteristics of students, and that different needs were identified if studies were split by gender.

Flowers and Pascarella (1999) conducted a 3-year study that compared 172 African American students at historically Black colleges (HBC's) and

predominantly White universities (PWI's) that included controls for individual and institutional influences. Differences in pre-college characteristics were not part of the controls. The study utilized the Collegiate Assessment of Academic Proficiency Form from the ACT tests, the College Student Experiences Questionnaire, and the National Survey of Student Engagement. They reported a significant but modest effect of attending an HBC, although with a very small change in the magnitude of the coefficient when college experience variables were added, the effect was reduced to nonsignificance. There was a positive effect on critical thinking for males but not for females, and attendance at HBC's influenced gains in writing and thinking skills of younger students. Gains were diminished for students who were older, for students who took more courses in math, technical, or professional areas, and for students who completed more credit hours.

Sedlacek (1999) reviewed the literature of the 1970's and 1980's related to his non-cognitive measures and implications for Blacks who attended PWI's. He observed that Blacks continued to have difficulties with self-concept, racism, and developing a community. He cited studies that supported the concept that the Black student who was able to navigate a culturally-biased environment, find a unique way to culturally adapt, deal with racism, and cope with more isolation due to the lack of Black peers and role models, was more likely to stay in school. He suggested that some Black students who graduated from PWI's had developed more unique personal



coping skills and a greater ability to handle complex problems than most other students.

Astin (1985) believed that student involvement was the key to retention and student time was one of the most valuable university resources. Colbeck (2000) discovered in interviews with students and with focus groups that engineering students developed networks that moved from class to class as they experienced positive group experiences, and they gained a better understanding of communication skills and group dynamics that was not available in traditional classes. Students in group projects had to implement better planning skills and make both personal and academic connections. Some enhanced their leadership skills, and all learned how to divide tasks. The students mentioned that faculty guidance was important, particularly for courses early in the curriculum that included larger numbers of students who had not previously worked on collaborative projects.

Tinto and Love (1995) assessed the effect of participation in learning communities at a northeastern, urban community college. The communities were created by linking classes, both logistically and pedagogically, that were required for the students' majors. The classes were scheduled as blocks to allow for work schedules. The activity levels of the participants with faculty and other students were similar to non-participants. However, their perceptions of interactions with other students, faculty, counselors, and campus climate were more positive. Tinto, Goodsell-Love, and Russo (1993)

and Tinto (1997) obtained similar results in studies at a large, northwestern, public university and at a northwestern community college, including higher retention.

Gardner (1996) recommended the creation of living/learning communities because they promoted living on campus, they provided captive audiences for programming at the location where students spent the greatest amount of time, they provided opportunities for increased interaction with staff and faculty outside the classroom, and they combined social and academic integration. They buffered students from adjustment difficulties, and laid the foundation for integration into the university and the academic community. Students who participated in living/learning communities made better grades just by increasing the quality of effort, even if the quantity was no greater (Kanoy and Bruhn, 1996). Students who participated in living/learning communities were retained better after controlling for academic aptitude, high school achievement, educational aspirations, and socioeconomic status (Pascarella and Terenzini, 1980).

Nagda, et al. (1998) evaluated the impact of participation in student-faculty research partnerships at a large, midwestern, public university. The program targeted women and ethnic minority students with an interest in sciences, but the population was no different in the pre-admission variables of test scores and high school grades than the control group of students not selected for the program. There were no statistically significant differences in

attrition rates from the first to the second year for the entire group or for minority subgroups. However, the attrition rate for African American students was only 10.1 percent compared to 18.3 percent for non-participants. The attrition rate was 6.1 percent for Anglo participants compared to 3.2 percent for non-participants, and 11.6 percent for Hispanic participants as compared to 11.3 percent for non-participants. It was noted that the Hispanic population at the university was very small, and a large percentage of Hispanic students were from outside of the state.

### *Isolation*

Tinto's fourth cluster incorporated issues of isolation. Some students who departed as a result of feelings of isolation appeared identical to successful classmates, but had more difficulty developing strong bonds to other individuals on campus. Tinto believed that feelings of isolation, periodically experienced by most students, could be minimized by providing opportunities for warm personal interaction with faculty or staff and opportunities to strengthen bonds through student life experiences. He suggested that becoming part of a student community usually enhanced retention. He noted that continued identification with previous outside communities reduced a student's ability to identify with a new community within the university. This was particularly true for students with significant and continuing family responsibilities.

London (1989) conducted interviews of first-generation college students who were attending college in the Boston area and their families. He found that these students struggled with the roles they had been assigned as a result of multigenerational family dynamics. Those in parent-child relationships that were overly binding had experiences during college in which it appeared their parents undermined their efforts to succeed and remain in college. They were pushed to succeed, but were pulled back from becoming too different. The struggle to balance the conflicting goals imposed by their parents and families injected periods of anger and guilt into their college years. One student, the bright child of the family, dealt with the conflict of being delegated the task of going to college, but then immediately being excluded from the traditionally-defined family. In her situation, her personal challenge became to find a way to use her education to transform her loneliness into a more comfortable solitude. Many of the students interviewed found that the issues they struggled with could not be discussed with their families and since they needed to appear less different to their classmates, they also could not discuss the issues with their peers.

Bean and Metzner (1985) addressed the interaction effects between academic and environmental variables for nontraditional students. They concluded that when both academic and environmental variables for these students were good, they were more likely to be retained, and when both were poor they were more likely to leave. When academic variables were

good, but environmental support was poor (the student could manage academically, but either had no consistent childcare arranged or had a work supervisor who was unsupportive), the nontraditional student was more likely to leave. When academic support was poor, but environmental support was good, the student might struggle but was more likely to remain enrolled.

Tinto (1993) made three observations as he concluded his discussion of the development of his model. The first was that a student's perception led to actions or consequences so the context of perceptions needed to be understood. The second was the relationship between the student and the institution reflected continual interaction, and the institution could enhance integration opportunities by fostering communities. The third was a reiteration that both social and academic involvement were necessary for successful integration.

### Independent Variables

The pre-admission variables that were included in this study include the background characteristics of gender, ethnicity, parent's education level, and the type of high school (targeted or non-targeted). Two cognitive pre-admission variables were high school academic performance and standardized test scores. Two non-cognitive pre-admission variables were the level of participation in leadership activities and service activities. Two

post-admission variables that were considered were choice of college at the university, and on-campus or off-campus residence during the freshman year.

### *Pre-admission Background Variables*

*Gender and Ethnicity.* The enrollment in all postsecondary institutions in the U.S. in 1999-2000 was comprised of 56% women and 44% men, and minority students made up about one-third of the population (National Center for Education Statistics, 2002). Black students comprised 12%, Hispanic students comprised 11%, and Asian students comprised 5% of the *college* population.

According to the Office of the Comptroller of Public Accounts for the State of Texas, the populations in the public schools in the 1996-97 school year was 29.1% Hispanic and 12.1% African American (Sharp, 1999). In the fall of 2000, Hispanic and African American students comprised 19.6% and 9.8% of the students enrolled in four-year universities in Texas (Texas Higher Education Coordinating Board, 2002). In an evaluation of attendance patterns, retention, and six-year graduation rates of students who graduated from Texas high schools in the 1991-92 school year, Dowling (2000b) reported that there were 162,270 graduates. Of these, 39,364 (23%) enrolled in a four-year public universities, and 33,767 (25.3%) enrolled in either community or technical colleges. Of the 44,195 Hispanic high school graduates, 8,074 (16.8%) enrolled in four-year institutions and 7,572 (22.8%)

enrolled in community or technical colleges. Of the 19,820 African American high school graduates, 4,851 (20.9%) enrolled in four-year universities and 3,474 (18.4%) enrolled in community or technical colleges. First-year retention within and across all state institutions was 86.9% for Anglos, 82.5% for Hispanics, and 73.8% for African Americans. Six-year graduation rates were 68.5% for Anglos, 57% for Hispanics, and 42.6% for African Americans. His analysis is currently being updated.

There is no shortage of evidence that students of different ethnicities entered college with different pre-admission characteristics and preparation (Phillips, Crouse, and Ralph, 1998). Disparities in academic achievement between African American, Hispanic, and Anglo students were evident even in the early years of elementary school (Camara and Schmidt, 1999; Phillips, Crouse, and Ralph, 1998). African American and Hispanic students were more likely to have lower test scores and *grades in high school classes* (Camara and Schmidt, 1999; Jencks, 1998). Females were more likely to have better grades and took more foreign language courses in high school, but took less math in high school (Stephenson, 2001) and were underrepresented in the highest levels of test scores (Astin, 1993). African Americans were more likely to have attended predominantly minority schools in less advantaged school districts (Phillips, Crouse, and Ralph, 1998; Kozol, 1991). African Americans and Hispanics were less likely to have access to or have taken AP courses (Camara and Schmidt, 1999; Stephenson, 2001).

African American and Hispanic students' parents were less likely to have college educations, and African American and Hispanic students were more likely to enter college with less financial support from their families (Phillips, et al., 1998; Pennock-Roman 1990; Kraft, 1991). African American and Hispanic students were more likely to come from socio-economically deprived backgrounds and were more likely to have to work to support themselves (Phillips, et al., 1998; Seymour and Hewitt, 1994; Tinto, 1993). Some first generation students were faced with new and complex family dynamics (London, 1989).

Some students who had less preparation faced difficulties in majors that were more demanding in the freshman year of the curriculum (Seymour and Hewitt, 1994). Even though all students benefited from faculty-student interaction, minority students and women felt the need for support from minority and women faculty (Seymour and Hewitt, 1994; Tinto, 1993).

Women were more likely than men to drop out of college for personal reasons, whereas men were more likely to leave for academic reasons (Pantages and Creedon, 1978; Tinto, 1993). Women were more likely to marry while in college (Astin, 1993). Some women foreclosed on the decision to consider some occupations because of low self-efficacy (Lent, Brown, and Hackett, 1996). Family responsibilities were more likely to result in lower degree completion rates for women than men; for men, marriage actually contributed to increased degree completion (Astin, 1975, 1993). Men



were less likely than women to complete a degree at a four-year institution if their initial commitment to a two-year institution was high (Pascarella, Smart, and Ethington, 1986).

Tinto (1993) suggested that retention was based upon the university's commitment to be involved in the academic and personal development of students because the student's commitment to degree completion at the university resulted in continued enrollment. He believed that a student's decision to leave a university was based more on what happened after admission rather than on experiences or preparation prior to admission. He observed that the population of new students in higher education was increasingly diverse in age and ethnicity, and that the percentage of female students was increasing. Tinto (1993), Murguia, Padilla, and Pavel (1991), and Donovan (1984) found that African American and Hispanic students had more difficulty adjusting to the new academic environment than to the new social environment. Astin (1975) found that African American students were retained at the same rate as Anglos when he controlled for high school grades and test scores, but Hispanic students had lower retention rates.

In a large study across institutions, Cabrera, et al., (1992) found no support for the proposition that academic underpreparedness caused attrition among African American students, except as a possible indirect effect. They found that for African Americans, family support outweighed academic preparation. However, family support was also important for Anglo students.

They found that a perception of prejudice had a stronger effect on African American students, but it also had an effect on Anglos. They concluded that the common findings across ethnicity suggested that if a university focused resources on meeting student needs rather than framing support around ethnicity, the university could foster tolerance at the same time it enhanced retention. They suggested that the growth of classroom-based learning communities offered great promise because they provided the opportunity to combine the academic and social contexts.

*Parent's Education Level* . Stephenson (2001) observed that the parents who were most likely to understand selection of courses and tracks in high school that led to success in college were parents who already had college experience. He *suggested* that the quality of information that was provided to parents in Texas, particularly those who were less economically advantaged, about course sequences in junior high and high school and high school diploma options could be improved.

Tinto (1975), Pantages and Creeden (1987) , and Grayson (1997) documented that parent's education level/socioeconomic status was positively related to academic progress and/or degree completion. Riehl (1994) found that there was no difference in high school class rank for first-generation students compared to students whose parents went to college, but their high school grades, SAT scores, degree aspirations, self-predicted first-semester college grades, actual first-semester grades, first-semester drop-out

rates, and return rates to the second year were lower. Terenzini, et al. (1996) surveyed first-year students and found that the biggest differences between first-generation students and their peers were the levels of family income, and the likelihood they were Hispanic. They had lower critical thinking abilities, studied fewer hours per week, and had lower degree aspirations. They were more likely to be older and have dependents, and took longer to complete degrees. Terenzini, et al. (1996) and Bowman and York-Anderson (1991) documented that first-generation students had less support from their families.

Phillips, et al. (1998) agreed with Herrnstein and Murray (1994) that socioeconomic status explained as much as a third of the black-white test score gap. They suggested, however, that up to two-thirds of the gap may be explained if other family factors were included such as mothers' high school quality, grandparents' educational attainment, mothers' household size, mother's perceived self-efficacy, and mother's parenting practices. They disagreed with Herrnstein and Murray's (1994) conclusion that there could be genetic differences related to ethnicity and cognitive ability.

Phillips, et al. (1998) questioned whether traditional socioeconomic status models were an adequate representation of parent's education level. They observed that the quality of public education provided to minority students had not been the same as that provided for Anglos and that the large majority of minority students who attended college did so at less

selective universities and community colleges. They also noted that the available data usually was restricted to mother's education level, and excluded any positive impact, however incremental, that the father's educational background provided. They also observed the limitation created by a focus on parental income, excluding the impact of parental wealth and suggested that parental wealth may have had more to do with the place of residence and public school district as well as the ability to afford better quality higher education. They included an analysis of the impact of grandparent variables because they believed that if it could be demonstrated that differences were apparent due to the influence of grandparents, then they could conclude that it takes several generations to correct the outcomes of previous inequalities.

*Quality of High School.* Kozol (1991) recalled the experience of beginning a teaching career at a disadvantaged inner-city elementary school. He then moved to a suburban school in 1964. He was shocked by the differences in resources and facilities. During the 1970's and early 1980's, he left public education, but was drawn back to it in 1988. He visited 30 different neighborhoods across the country, and interviewed students in those schools. He was surprised by how much segregation had increased and how much inner-city schools appeared to be garrisons in third-world neighborhoods.

Kozol discussed disparities that were created by current funding systems for public education. The local taxes provided enough revenue for

some schools to operate, but not for all. State funding for the poorer school districts equalized the resources to a certain level. However, the minimum funding levels that the states set were based on a standard equal to funding levels for the poorer schools rather than more affluent schools. Because of state politics, the minimum funding level often reflected what politicians and constituents from the more affluent districts thought was sufficient for the poorer districts. Often, to get political agreement, there were some additional resources provided for the affluent districts.

Kozol described the circumstances surrounding the disparities in funding between the Edgewood ISD and the Alamo Heights ISD in San Antonio. Edgewood had to operate at a funding level of \$231 per student, and Alamo Heights had \$412 per student. A more recent example of disparities in adjacent school districts in Texas was provided in Texas Education Agency (2002) data. There were 159 elementary schools in the Dallas ISD. Of these, only 5 received an exemplary rating by the Texas Education Agency. There were 38 elementary schools in the Plano ISD, and 23 received exemplary ratings.

Phillips, et al. (1998) used data on 1,626 five- and six-year-old children from the Children of the National Longitudinal Survey of Youth (CNLSY) that tracked children born to over 6,000 women between 1980 and 1987. The sample included an overrepresentation of those who were low-income and minority. The children had been given the Peabody Picture Vocabulary Test-

Revised (PPVT-R). They found that for each year of education for the mother, an African American child's vocabulary score increased more than the score for the Anglo child, even though Anglo mothers usually attended better schools. One piece of data related to the quality of the mother's education which they found interesting was the teacher turnover rate at the mother's high school. They found that this rate was a small but significant predictor of the child's PPVT-R score, after controlling for mother's cognitive skills. The African American mothers went to high schools that were 59 percent minority, and the Anglo mothers went to high schools that were only 14 percent minority. The authors acknowledged that the difference in PPVT-R scores was small. For each one percent reduction in teacher turnover there was a corresponding increase of one-seventh of a point in the scores. However, they felt that the accumulation of small results in their study could be combined in future research to explain a large portion of the gap in test scores such as SAT scores.

Stephenson (2001) found that the factors that contributed to completion of a four-year degree for students in Texas high schools were taking high levels of math and language classes, the type of high school diploma obtained, and the location of the high school. The variables that contributed most to four-year degree completion were being female, White, not economically disadvantaged, completing calculus, completing two years of foreign language, completing an advanced track, and attending a rural high

school. The variables that contributed to the least successful profile five years after matriculation to college were being African American or Hispanic, economically disadvantaged, beginning at a community college, less math and foreign language, completing a regular diploma, and attending an urban high school.

### *Pre-admission Cognitive Variables*

*High School Academic Performance.* A student's high school grades have usually been considered the best single predictor of college academic performance (Richards, Holland, and Lutz, 1966; Astin, 1975; Grayson, 1991; Bowen and Bok, 1998; Ting and Robinson, 1998; Widaman, 1998). When combined with the student's best SAT score, Camara (1998) testified that the pair provided a stonger prediction than just high school grades. However, correlations between prior performance and standardized tests still typically accounted for no more than 20% of the variance in retention (Astin, 1993). Widaman (1998) stated that the amount of variance in freshman college grades explained by the combination of the SAT and high school performance was between 23 and 25 percent. He said some viewed this as insufficient, but when the population was restricted to top high school achievers, this was respectable. Ting and Robinson (1998) noted that high school GPA was a stronger predictor for women than men.

Camara and Schmidt (1999) explained that on a four-point scale the difference between high school and college grades could be over a point and that there was often an overprediction for Hispanic and African American students. African American students dropped from a mean GPA of 3.18 in high school to a freshman average of 2.14, and Hispanic students dropped from 3.43 to 2.37. Camara and Schmidt listed lack of advanced math and science courses in high schools and lack of access to AP courses as contributors to students arriving for college underprepared. They noted that 83% of students who completed one or more AP exams in 1997 were White or Asian American. They found that even when they kept parents' education level and household income constant, there were still differences in completion rates across ethnic groups for the more advanced math and science classes in high school. Despite taking less rigorous courses, the GPA's for African American students whose parents had high incomes were lower than their Asian American or White counterparts whose parents had low incomes. Bell-Rose (1999) performed a cross-sectional analysis and found that African American students with SAT scores above 1200 had lower GPA's and class ranks than their white peers, even though they also had similar participation rates in intellectually stimulating extracurricular activities.

Pennock-Roman (1990) discussed many factors that have been measured within existing student populations to determine indicators for success for Hispanic students during the freshman year. She found the



quality of the high school preparation the most difficult to evaluate. She observed that the high school ranking of Hispanic students tended to overpredict their performance, a possible indicator of a lower-quality high school experience, although the overprediction was not consistent across different Hispanic subgroups.

Bowen and Bok (1998) found that at twenty-eight selective universities, students who graduated in the top ten percent of their high school class had a college class rank that was 11 points higher than those who were not in the top ten percent of their high school, and for African American students their college rank was 6 points higher. In the analysis of the records of over 100,000 students, they found that the combination of the high school record and standardized test scores still provided the best prediction of graduation from college.

Stephenson (2001) found that the types of courses taken in high school contributed to completion of college degrees in four years. These courses included higher math courses and multiple years of a foreign language. Yet, African American and Hispanic students were underrepresented in the enrollments in these classes. Camara (1998) cited data from the Department of Education's Equity 2000 initiative that 83% of students who completed algebra and geometry in high school enroll in college. Stephenson suggested that current practices provided inadequate information to students and parents, particularly those from disadvantaged

backgrounds, about course sequences that need to be initiated in junior high to lead students to completion of advanced courses in high school. However, he observed that the high schools with higher percentages of disadvantaged students offered fewer of these courses. Stephenson also recommended that current tracking mechanisms be reevaluated because they had negative impacts on students who have not had the best educational opportunities in elementary school or who may have had academic difficulties but still had the potential to catch up.

Phillips, et al. (1998) presented data to demonstrate that gaps in educational levels between African American and Anglo students began long before junior high. There was a gap when the students first enrolled in elementary school. That gap actually increased as the students progressed through public schools. African American students who even began at the same skill level as Anglo students lost ground by the time they completed elementary school. They calculated that for African American students, the drop in comparison to their Anglo peers in math and reading was equivalent to a decline of 35-40 points on each part of the SAT.

*Standardized Test Scores.* Camara (1998) observed that the SAT was created to give universities the ability to reduce the impact of different grading practices in high schools as they evaluated the records of applicants. It was a test of verbal and reasoning skills. Camara stated that 70 percent of students have college grades at the same high, moderate, or low level of their

SAT scores. The ACT test was developed to test academic competencies and reflected more what the students learned in high school (Chapman, 1998). It provided an assessment in English, mathematics, reading, and science reading that could be used to aide in placement decisions during the freshman year of college. Chapman (1998) suggested that standardized test scores should be used to help students succeed rather than a screen for admission decisions.

The validity of standardized test scores when used to predict performance in college has been analyzed and questioned since the creation of the tests. Barnes (1922) noted variation in difficulty from one year to the next. He criticized the use of quantitative evaluation for subject matter that was not exact and the impact of teaching to the test. A few years later, the College Entrance Examination Board (1925) voted to approve a recommendation to include a psychological component to the test then named the Scholastic Aptitude Test. By 1928, the new test had been administered to over 23,000 college candidates and was available to preliminary candidates entering their last year of high school (College Entrance Examination Board, 1928).

Holland (1959; 1960; 1964) conducted several studies comparing and combining the SAT with other instruments. He tested 743 National Merit Finalists and 578 Certificate of Merit winners a month before their first fall semester with the California Personality Inventory (CPI). He found that there

was variation across colleges, majors and genders in the ability of SAT verbal and math scores and the subscales of the CPI to predict grades. In general, the Socialization and Social Presence subscales were significantly related across groups. The CPI was more efficient than the SAT, but Holland noted that the homogeneity of the group in regards to the individual SAT scores kept the correlations low. Among the students with high scores, personality variables added greatly to the validity coefficients of aptitude measures alone.

In a study of psychology majors, Elliot and Strenta (1988) compared grades for males and females in two required courses in analysis and design. They found that the mean female SAT score was 19 points lower than the mean male score, the mean female SAT math score was 26 points lower than males, but the mean female GPA was .13 higher than males.

Goldman and Hewitt (1976) found that since the language component of the SAT is more dominant for minorities, a weakness in interpreting written instructions would lower both verbal and math scores. Linn and Harnisch (1981) proposed that using words that are less familiar to one group than another when the words themselves are incidental to the ability the items are supposed to measure that the testing may produce results that are biased toward one group over another. Schmitt (1988) analyzed language issues that affect Hispanics taking the SAT. He found that cognates favored Hispanic functioning as did items with content of special cultural interest. False cognates impeded performance as did homographs. Schmitt and

Dorans (1990) found that minority students were disadvantaged in test-taking because of slower completions. After analyzing the progress of Hispanic students at six universities, Pennock-Roman (1990) found that Hispanic students' scores reflected lower performance on the SAT math test at five of the six institutions studied.

Flemming and Garcia (1998) compiled data regarding the validity of SAT scores as a predictor of freshman grades. She cited twelve authors whose work showed that for White students, the average variance accounted for was 11.7%, and for 12 authors whose work showed that for Black students the average variance accounted for was 14.7%, and noted that previous research indicated that SAT scores predicted grades better for African American students attending predominantly African American schools. However, the variance accounted for in the previous studies for White students at public institutions ranged from 0.4% to 27%, and in the studies for African American students the variance accounted for ranged from 0.1% to 37%. Her study compared African American students attending both types of institutions. Her study included 746 students at 7 predominantly African American and 739 students at 8 predominantly white institutions. For African American students in White schools, the amount of variance accounted for was 10.6% compared to 9.9% in the 8 schools measured by previous authors. For African American students attending African American schools,

the amount of variance accounted for was 12.9% compared to 21.3% in the 4 schools measured by previous authors.

Steele and Aaronson (1995) found that when they compared African American and White students at Stanford on difficult verbal questions from the GRE, they found that blacks underperformed in the group that was told the test was ability-based (the diagnostic group), but performed equally as well as whites when told it was not ability based. Steele and Aaronson (1995) then attempted to determine if they could trigger stereotyped thinking, and whether that experience could make them want to avoid being seen as a stereotype. First, students were asked to complete word combinations that could be completed in a way that reflected the African American stereotype. Then they were given the option to record their race. Whites in both groups listed their race, but only 25% of the African Americans in the treatment group did so. They believed the results of the different treatments demonstrated that a situational, stereotype threat may be the explanation for the gap in African American and White SAT test scores.

Steele (1997) noted that gaps in performance on the SAT test between African Americans and Whites were as large for African Americans at higher socioeconomic levels than they were for African Americans and Anglos in the lower socioeconomic level. He analyzed how African Americans are affected by the stereotypes they think they must overcome. He observed that negative stereotypes could affect any member of a group, that sensitivity to a

negative stereotype could be turned on in particular situations, and that a negative stereotype could affect individuals who do not even believe in the stereotype. Negative stereotypes could even affect those individuals who performed at the highest levels.

Spencer, Steele, and Quinn (1997) found that when they selected students, mostly college sophomores, who were good at math or literature, and intentionally presented them with math problems that would push them beyond their ability levels, women significantly underperformed on math but not on literature. They presented difficult math questions preceded by several different treatments to arouse different levels of stereotype threat in women. The difference in one treatment was to tell each group that the test either did or did not measure individual ability. When women were told prior to the test that no gender differences were expected, they performed equal to the men. When the most situational pressure was present prior to taking the test, they found that the women's anxiety levels after completion of the test was a better predictor of performance than their expectations.

Jencks and Phillips (1998) identified five types of bias in standardized tests. The first was labeling bias, which they identified by citing studies that showed that tests that are called aptitude or intelligence tests do not always measure these aptitudes well. The second type, content bias, was the type of bias that is present when a test includes more items that reflect one particular culture than another culture. To define the third type, methodological bias,

they cited studies and conducted a small study to demonstrate that the environmental context within which the test is given can affect the results. Prediction bias was the fourth type, and the authors provided numerous examples that tests resulted in an underestimation or an overestimation of academic performance. They called the last type of bias selection system bias. This was the bias that occurred when the selection system was flawed because it was partly based upon flawed tests.

Phillips, et al. (1998) challenged Herrnstein and Murray's (1994) conclusions that part of the gap in SAT or other test scores might be attributable to genetic differences based upon ethnicity. They documented that standardized test scores for African American students rose over the past 40 years. They concluded that the environments of the student and of the test contributed to the differences between White and Black students' test scores. When they added other criteria to test scores such as achievement scores, high school grades in core subjects, advanced placement data, and high school quality, they found that they predicted college grades more accurately. They found that when they expanded the usual criteria to include additional factors from the grandparents and parents such as education levels, mother's household size, mother's high school quality, and other criteria, they could account for more than half of the test score gap between African Americans and Whites.



They suggested that the inclusion of even more environmental factors could explain the entire gap.

Bowen and Bok (1998) used data from the College and Beyond database that included over 80,000 students at twenty-eight selective colleges and universities to ascertain whether or not African American students were experiencing difficulties when admitted with SAT scores that could make it appear that they were less prepared for college. They split the SAT scores into one hundred point increments except for combining all scores less than 1000 and all scores greater than 1300. They found that Blacks with lower SAT scores graduated at higher rates at the most selective of the selective schools, and the lowest graduation rates were at the least selective of the selective schools.

#### *Pre-admission Non-cognitive Variables*

*Leadership Experience.* Much of what has been written about leadership has been related to the development of theories about leadership and leader characteristics (Northouse, 1997). The literature is limited on the effects of leadership experiences and leadership training, particularly in regard to academic achievement.

Holland (1959; 1960; 1964) suggested that the analysis of independent achievement and creativity may provide more valid criteria for the selection of students than standardized test scores. In his analysis, he

used a High School Achievement Scale that reflected participation in activities including science, art and leadership. A second instrument was the Vocational Preference Inventory which had scales that reflected decidedness on vocation, range of experience, range of competencies, deferred gratification, super-ego, independence of judgment, intellectual resources at home, aspirations and goals and self-ratings of personal traits. Holland found that items such as daily activities related to achievement in high school were the best predictors of achievement in college. He found that the addition of other single significant variables such as art or music often lowered the predictive validity, but leadership did not.

Several more recent studies have attempted to analyze the impact of leadership training on adolescents and college students. Benson (1991) conducted a thorough review of the literature and found only three scientific studies of youth leadership training. The group of forty-two high school students that he studied at the Blue Lake Center Youth Leadership Seminar served in leadership positions in provincial associations. He used the Leadership Assessment Questionnaire, Battle's Self-Esteem Inventory (Battle, 1981), and an Action Planning Questionnaire as a pre-and post-test along with qualitative data generated from interviews. The post-tests and interviews were conducted three months after the training. He found that the students' perceptions of their leadership effectiveness were significantly increased. Their responses reflected that the most important changes were

in improved communication skills, increased understanding of other people, increased understanding of self, increased self-confidence, and increased ability to take risks, initiate activity, and become involved.

Gregoire (1994) separated 102 fifth-grade students into two groups that were stratified by gender and ability to ascertain the effect of a cooperative learning group with or without leadership training on science achievement, attitudes toward science, and the classroom climate. The two groups were subdivided into balanced subgroups of four. Leadership training that involved the rotation of leadership roles in the group was the experimental treatment. The students participated for one hour each day for twenty days. Results showed no difference in the students' view of the classroom climate, attitudes toward science, verbal interaction, or science knowledge. However, students in the leadership group showed positive, significant differences in lab performance, greater targeted leadership skills during verbal interaction, and greater comfort with competition.

Roberts (1997) analyzed the impact of leadership training on thirty-five ninth-grade students compared to thirty-five control group students as it affected their academic achievement, disciplinary referrals, extracurricular activities, and leadership skills. The students in the treatment group volunteered to attend one of two three-week sessions of the Summer Leadership Institute. Results were measured with the California Test of Basic Skills and the Leadership Skills Inventory. The results showed that students

in the treatment group scored significantly higher in reading achievement and on four of nine domains in leadership skill. These were Speech communication skills, values clarification, group dynamics, and fundamentals of leadership. They were also more involved in extracurricular activities.

Brungardt and Crawford (1996) used Kouzes and Posner's (1987) five leadership practices to analyze the effects of several leadership courses at Fort Hays State University. They used the Leadership Practices Inventory to compare students who were entering and exiting the courses. In response to a survey, students indicated they had enhanced their leadership skills, developed greater self-esteem and self-understanding, better communication skills, an increased commitment to service and improved decision-making and problem-solving skills.

A series of studies that looked at the predictive value of non-cognitive variables, including leadership, in regards to predicting college retention began with Sedlacek and Brooks (1976). They expressed concerns about the institutionalization of racism through such mechanisms as college admission based upon standardized test scores that favored traditional middle and upperclass students. Sedlacek (1977) identified seven non-cognitive variables that might enhance the ability to predict retention more effectively than models based solely on standardized test scores and high school grades. These included: (1) positive self-concept, (2) realistic self-appraisal, (3) understanding of and ability to deal with racism, (4) preference for long-

term goals over short-term needs, (5) availability of a strong support person, (6) successful leadership experience, and (7) demonstrated community service. Concerned about the flatness and possible downturn in the numbers of minority freshmen entering universities, and a reduction in special support programs due to financial constraints, Sedlacek and Webster (1978) recommended that schools use more non-traditional variables when evaluating minority applicants.

Tom (1982) collected data from the College Board's Student Descriptive Questionnaire that was administered to 444 freshmen entering a west-coast university. Two non-traditional variables had an effect for students who began in 1978. Factor 1 (Communicator/Leader) was the only one for these students that had a positive effect on GPA's. Factor 5 (Music, Dance, Art Interest) and Factor 9 (Interest in Basic Skills Assistance) had significant ( $p < .01$ ) positive influences on GPA for the students who began in 1980.

Tracey and Sedlecek (1984) assessed the reliability, construct validity and predictive validity of the Non-Cognitive Questionnaire (NCQ) and found that there was support for six of the seven non-cognitive variables. They compared the predictive validity of the NCQ for Anglo and African American students who entered a large, predominantly White eastern university in 1979 and 1980. In regards to first-semester grades and third-semester grades, more of the NCQ variables were predictive for Whites. For both races, the significant ( $p < .05$ ) predictor variables were positive self-concept and realistic

self-appraisal. For Anglos, other significant ( $p < .05$ ) predictor variables were community involvement, leadership, and preference for long-term goals. The predictive power for African Americans was higher than that for Anglos for third-semester retention as a result of four variables: realistic self-appraisal, positive self-concept, support, and community involvement. White and Sedlecek (1986) found that with a group of specially-admitted African American students, leadership and positive self-concept were the significant ( $p < .05$ ) predictors of GPA after two semesters. Understanding racism and leadership were significant ( $p < .05$ ) predictors after three semesters, and positive self-concept, support, and understanding racism were significant ( $p < .05$ ) predictors after four semesters.

Ting and Robinson (1998) gave the NCQ and the First Year Student Survey to 3,216 students during a new student orientation at a southeastern, public, land grant, research university in the fall of 1996. Variables that contributed to the prediction of the first fall GPA for Anglo and African American students included high school GPA as the strongest variable, father's education level, importance of personal development, positive self-concept, and preference for long-term goals. The personal development indicator included taking responsibility for one's behavior, improving leadership skills, coping with change, handling stress, time management, and self-discipline.

Ting (2000) analyzed NCQ data on 96 Asian American students who participated in the same 1996 assessment. Predictor variables for fall grades in the model were realistic self-appraisal system, successful leadership experience, and SAT-math scores. Variables for spring grades were a realistic self-appraisal system, demonstrated community service, and SAT-math scores.

Ting (1998) analyzed the success of 54 first-generation or low-income freshmen who completed the NCQ in a special support program in a public, comprehensive university in the upper midwest. He found that high school rank, leadership, and community service were effective predictors of GPR after the second semester, and that leadership was the most significant non-cognitive variable.

*Community Service/Service Learning Experience.* One of Astin's (1977) findings was that students who participate in college extracurricular activities are more likely to be satisfied with college and less likely to drop out. There has been increased interest in the last decade of promoting participation in service activities on campuses across the nation (Levine, 1989). Levine interviewed Robert Coles, professor of psychiatry and medical humanities at Harvard, about the role of service in education. Cole's vision included participation of students from all backgrounds, participation of public school teachers, and participation of university professors whose commitment to service would be a reflection of both a pedagogical and moral nature.

Rhoads (1997, p. 95) presented ten propositions that supported his belief in student involvement in service. The first five related to the development of the self and the influence of culture. The last five were:

- Postmodern identities are more fragmented and decentered, and the challenge to establish a clear sense of self is more vexing than ever before.
- College students are at a time in their lives when a multitude of forces influence their sense of self; thus they often are in the midst of a period of heightened self-discovery and identity confusion.
- Educational plays a critical role in fostering student learning and development and thus provides a context for student self-exploration and identity development.
- Participation in community service provides a means to foster a sense of connectedness and offers an opportunity for students to understand themselves and to develop caring selves.
- Caring selves are critical to the process of democracy and the struggle to build a more just and equitable society. Without a strong concern for others as a vital aspect of the self, it is unlikely that democracy can be sustained in postmodern times.

Rhoads discussed the concept of mutuality in community service. Those doing service needed to see the service as working with people, with both parties benefiting. In a discussion of a student service project on South Carolina's St. John's Island, Rhoads (1997, 1998) noted that the experience provided an opportunity to move students away from a competitive campus environment. The experience helped them broaden their understanding of different social environments and experience the mutuality that is necessary for the support of a community.

One of the student profiles that Rhoads presented was a student who was first involved in a community center that provided programs for teenagers



and later worked with a program that provided support for the homeless and for recovering alcoholics. The student reflected on how, through her actions and reflections, she had learned about becoming a fair leader. A couple of other students reflected on how they had developed confidence in their ability to try to influence others, develop loyal support, and identify a need for greater personal motivation.

Weichowski (1992) presented the case for academically-based community service. He subscribed to the historical perspective that the purpose of college was to develop moral leadership as well as practical skills. He felt that it would address the decline in altruism and volunteerism among college students, it would reduce the college student focus on careerism, it would integrate the splintered academic experience with the whole academic experience and with the real world, and it could address issues relating to retention. Bringle and Hatcher (1996) presented an administrative rationale and structure that could be used to advance the implementation of academically tied service programs. They proposed that a mature program would include combinations of courses, integration into general education courses, and even an entire curriculum.

Using the Non-Cognitive Questionnaire (NCQ), Tracey and Sedlecek (1984) found that for both African American and Anglo students, the strongest predictor variables were positive self-concept and realistic self-appraisal. For Anglos, other predictor variables included community involvement. The

predictive power for African Americans was higher than that for Anglos for third-semester retention as a result of the first two variables, community service, and support.

Tracey and Sedlecek (1985) extended the analysis of the same group to eight semesters. They found limited predictive power for Anglos. The variables related to self-confidence, self-appraisal, and academic familiarity were constant across the semesters, and community service continued to contribute to retention.

Rogers (1984) administered the NCQ to 259 African American freshmen at a southeastern university. She found that high school grades were the best predictor, and SAT scores were not significant in predicting first-year GPA. Items from the NCQ that contributed to the model were community service, support of friends and family, and a belief that the university should use its influence to improve social conditions in the state.

After 6 years for those students who entered in 1979, and after 5 years for those who entered in 1980, Tracey and Sedlecek (1987a, 1987b) found graduation rates for Anglos significantly higher than African Americans. However, there were significantly more African Americans enrolled than Anglos among those still enrolled. More of the renamed NCQ subscales were found to be predictors of graduation of African Americans than Anglos. The most predictive subscales were Self-Assessed Academic Motivation, Perseverance, Support for Academic Plans, and Community Service.

Academic Self Concept and Expected Difficulty were the only two predictive subscales for Anglo students.

Arbona and Novy (1990) found that neither the NCQ factors or SAT scores predicted first-year grades or persistence for African American freshmen at a large southwestern university. For Hispanic students, the NCQ scale for Certainty of Academic Plans and the SAT math score predicted first-year grades, but neither NCQ scales or SAT scores predicted retention. The NCQ scale for Academic Familiarity and both SAT math and verbal scores predicted first-year GPR for Anglo students, but did not predict retention. The Academic Familiarity Scale included preference for long-term goals, family support for college, participation in academically related extracurricular activities and community service during high school. The authors cited differences in methodological techniques as possible causes for inconsistencies with other studies, and noted that further research needed to be conducted evaluating the NCQ scales.

Fuertes, Sedlacek, and Liu (1994) collected data on Asian American students over a ten-year period at a predominantly Anglo university in the northeast. They found that community service and acquired knowledge in a nontraditional area consistently predicted cumulative GPR over seven semesters.

Markus, Howard, and King (1993) presented results about integrating service into an academic course. Students in different small discussion group

sections of a large political science class were given different tasks. Two sections that included 37 students were required to participate in service, discuss their service experiences in the discussion groups, write a short paper, and present an oral report on their experiences. Other sections that included 52 students followed the traditional class experience combined with the discussion groups with a longer research paper that required the equivalent effort as the service. Students did not know ahead of time about the different section requirements, and were not allowed to change sections once enrolled. The authors found that the learning generated through service seemed to enhance the classroom learning, and promoted a greater change in scores on a battery of beliefs and values items. The students in the service-learning sections were more likely to report they performed at their potential and more likely to be interested in applying principles learned. They also had statistically significant higher grades.

### *Post-admission Variables*

Two post-admission variables were included in this study are choice of major and living on or off campus. These were selected because they have been shown to have a relationship with academic performance.

*Choice of College/Major.* Kramer, Higley, and Olsen (1994) found that 75-80% of college applicants selected specific academic fields for their

majors in college. Between 1980 and 1988 at Brigham Young University, only 45-56% of those remained in the original major at the time of graduation.

Astin (1993) found that choice of major could have an impact on retention. Some choices such as agriculture and mathematics had no effect, some such as biological sciences, education, and social sciences had a positive effect, and engineering had a negative effect.

Pennock-Roman (1990) studied Hispanic students from two very selective and four moderately selective universities in California, Texas, Florida, and New York. The mean SAT score for the students was 135 points higher than the national norms for Hispanics. She found that the grade point ratios for the students were overpredicted by SAT scores and high school rank. However, she found that Hispanic students were overrepresented in majors such as the sciences, engineering, or mathematics. When she controlled for college major, the overprediction was greatly reduced.

Seymour and Hewitt (1994) conducted interviews and focus groups with 335 students at seven four-year universities who began in engineering and science majors. They wanted to determine why some students eventually changed to different majors, and others remained, particularly among women and minorities. All of the students they talked to had SAT math scores of 650 or higher, so ability was not an issue. They found that those who changed majors and those who did not were not two different kinds of people. They had similar abilities, motivations, grades, and study-related

behaviors. The characteristics or issues that motivated changes of major were common among those who did not change. The distinguishing characteristics included the development of particular attitudes or coping mechanisms, and serendipitous intervention by faculty or mentors at a critical point.

As they began collecting information, Seymour and Hewitt (1994) found that the decision to change majors was the result of a 'push and pull' process over time. Engineers were more likely to tolerate the difficulties and frustrations because of perceived career rewards. Four issues that were not shared by changers and non-changers were concerns about the effort required, potential material benefits in proportion to those efforts, perceptions of the potential for low-satisfaction work environments (including the rejection of the role models), the experience with grading practices in which grades were curved, discouragement, and loss of self-confidence. Students who were academically gifted but who had attended less competitive high schools had no pre-developed psychological defenses to deal with lower grades. Less talented peers who had always had to work harder had those defenses.

Seymour and Hewitt (1994) were told that many women had to endure direct and indirect disapproval from some professors and TA's. Women seemed more concerned about how they would make career and personal goals fit together, whereas the men were more willing to place career goals above personal satisfaction. African American women were more reliant,

independent, and less prone to discouragement. Only 35.6 percent of students of color complete their degrees in the areas of science and engineering as compared to 68.4 percent of white students. About half of the students of color not only left the major, but left the college. Similar to women, non-Asian minority students felt pressure to discard cultural values if the decision was to change out of engineering and science majors. Asian families tended to interpret family responsibility as giving total effort to academics.

Bowen and Bok (1998) used data from the College and Beyond database on twenty-eight selective universities. Eleven of the universities were private Liberal Arts Colleges, thirteen were small or medium-sized research universities, and four were large, public, research universities. They found that the entering cohort of 1989 of African American students were equally represented in science and engineering majors, and over-represented in areas such as Psychology, Sociology, and Political Science.

*On-campus Residence.* Some research has shown that students who live on campus are more likely to be retained (Chickering, 1974; Astin, 1973, 1975, 1997, and 1993). It also has been shown that students whose primary social ties are to high school friends, particularly if they are not enrolled in college, and students who try to juggle major family or work roles may have more difficulty adjusting to college and becoming integrated into the educational and social environment (Astin, 1993). The effects of on-campus

residence include greater gains in artistic interests, liberalism, interpersonal self-esteem, leadership skills, greater involvement in academic and extracurricular interactions, and greater satisfaction with the educational experience (Astin, 1985).

Bliming (1989) collected more than 2,000 articles concerning the effects of living on campus in residence halls for his meta-analysis. He found that studies varied in whether or not they controlled for initial academic performance. When the differences were controlled, there were no significant differences between students living on campus or at home. He found that students in Greek houses are slightly less likely to perform well than students on campus. Last, he found that students living independently off campus were only slightly less likely to do well than students on campus. Anaya and Cole (2001) found no differences in retention for those students living on-campus or off-campus.

Pascarella and Terenzini (1980, 1981) found that freshman persistence, measures of intellectual and personal growth and a sense of an intellectual community were positively associated with a residence in a living/learning hall. They found that personal interactions between faculty and students made possible by the environment accounted for almost all of the treatment effects. Pascarella (1985) found that living on campus did not have a direct effect on either intellectual and academic self-concept or interpersonal and social self-concept; it did have an effect on student



involvement with peers and with faculty. Thompson, Samiratedu, and Rafter (1993) found no difference in the adjusted grade point average for regularly admitted students at a regional, public university in the southeast, but the developmental students who lived on campus had higher grades. All students on campus showed enhanced progress and higher retention.

### Summary

In a report by the Texas Higher Education Coordinating Board (2000), it was noted that the state already lags behind other large states in college enrollment. Only 5% of the population was enrolled in institutions of higher education, as compared to 5.6% for New York and 6% for California. The Coordinating Board set goals that included increasing the college population in the state by 500,000, increasing the number of student graduating from high quality programs by 50%, increasing the number of nationally recognized programs, increasing the level of federal science and engineering funding by 50%. It was noted that the gap in enrollment could not be closed without enrolling greater numbers of students from diverse populations within the state and graduating those students.

This study of retention has encompassed a vast array of literature crossing over several academic disciplines. Because of the availability of large national databases, researchers have been able to identify trends that have crossed institutional types and geographic areas. They have connected

patterns across groups based upon ethnicity, socio-economic status, gender, age, and a host of other individual characteristics. The major theories or models have been partially validated, but there is still much to investigate (Braxton, Sullivan, and Johnson, 1997). There are also challenges to the basic framework of models such as Tinto's model from critical theorists.

Tinto (1993) expressed hope that further research will provide universities better tools and practices that will be of use in institutional settings. However, he observed that it is not likely that any single blueprint will be created that will apply to every institutional setting. Rather, it is more likely that, given an increased understanding from multiple perspectives, the faculty and staff will be better equipped to act upon their desire to support the intellectual, personal, and social growth of the students based upon student characteristics and the characteristics of the institution.

### CHAPTER III

### METHODOLOGY

This study was performed with data on students who were admitted to Texas A&M University as new freshmen through the admission review process for the fall of 1999 and the fall of 2000. The data set was downloaded from the university's Student Information Management System (SIMS).

The admission process at Texas A&M University allowed for two sets of students to be automatically admitted. The first group included students who were in the top ten percent of a Texas high school, regardless of test scores. There was a combined total of 4,480 students admitted in this status in the fall of 1999 and the fall of 2000. The second group was referred to as academic admits and included students whose test scores were at least 1300 SAT or 30 ACT. These students' had to have been in the top half of their graduating class if they were residents of the state, or in the top quarter if they were not residents. There was a combined total of 3,012 students admitted in this status in the fall of 1999 and the fall of 2000.

Other admissions were completed through a review process. This process included a review of the information the student reported in the application in addition to the traditional academic criteria, and resulted in each student's being assigned a score. This score was the sum of two scores called the objective and subjective scores. The objective score reflected a

combination of test scores, rank in high school class, and rigor of courses taken. The subjective score was the average of two scores awarded by the admissions staff. These subjective scores were based upon information the student self-reported in the application (Office of Admissions and Records, 2001a). The objective score was based on SAT or ACT scores, percentile rank in high school class, and the number of advanced courses taken in math, science and language classes. The subjective score was based upon the evaluation of participation in high school extracurricular activities, leadership activities, community service, awards and talent, employment, association with A&M/Participation in A&M recruiting programs, legacy, educational level of parents and extenuating circumstances

The population in this study included all of the students who were admitted to Texas A&M University in the fall of 1999 and the fall of 2000 as a result of being assigned scores through the admission review process. The combined total of students for both years for this category was 4,462.

### Choice of Variables

Texas A&M University began using non-academic factors in admission decisions after the Hopwood case in 1996. Since that time, no analysis has been conducted to determine if the subjective admission scores have a relationship to retention. The investigator developed a hypothesis that there were relationships between or among academic and non-academic factors.

The variables selected for the study included the demographic characteristics of gender and ethnicity. This data were entered into the Student Information Management System (SIMS) from the student's application. The data for gender and ethnicity are provided in Table 1.

TABLE 1  
Gender and Ethnicity of Students Admitted With Review Points

Ethnicity	Gender		Total
	Female	Male	
Black	77	45	122
Hispanic	192	237	429
Native American	16	14	30
Asian	76	81	157
White	1,767	1,908	3,665
Other/Not reported	31	28	59
Total	2,159	2,298	4,462

Students who were female were coded as 0 and students who were male were coded as 1. Each student's ethnicity was entered into the set utilizing the same categories utilized by Admissions and Records for reporting data to the state.

SAT and ACT scores in SIMS were loaded from tapes from the Educational Testing Service and the American College Testing Service. ACT

scores were converted to SAT scores so that the highest score could be identified. A conversion table is presented in Appendix A.

Astin (1975), Grayson (1991), Ting and Robinson (1998) and Widaman (1998) found that high school performance tends to be the strongest predictor of college success. Each student's high school rank was obtained from an official high school transcript and entered into the SIMS system. Each student had the opportunity to update the rank from the end of the junior year with the rank from January of the senior year. There were 323 students whose high schools did not report a specific rank, but just listed them in a particular quarter of their class

One pre-admission factor that was taken into account in the final round of admission decisions was whether or not the student attended a high school that was a targeted high school. The Office of Admissions and Records identified high schools in the state as targeted high schools based on low rankings in criteria utilized by the Texas Education Agency (Office of Admissions and Records, 1998, 1999). These criteria included the percentage of students with limited English proficiency, the percentage of students who passed TAAS, dropout rates, the percentage of students taking advanced courses, the percentage of students who took the SAT/ACT, the mean ACT score for the students in the school, the percentage of economically disadvantaged students, and the average campus budget per student. There were 143 schools that were designated as targeted schools

for recruiting purposes in 1998-1999, and 100 in 1999-2000, and 226 students from these high schools were admitted through the review and enrolled at Texas A&M. Schools that were considered targeted schools in either year were considered targeted in this study, and there was considerable overlap in the lists for the two years. Non-targeted high schools were coded as 0 and targeted high schools were coded as 1.

Parents' education level is related to academic progress and/or degree completion (Tinto, 1975; Pantages and Creeden, 1987; Grayson, 1977; Riehl, 1994; ). The educational level of parents in this study was self-reported by the student in the application. The numbers assigned to each student ranged from 0 to 6, but were assigned by two different offices at the university using two different scales on two different fields in the Student Information Management System (SIMS). The data from Screen 288 in SIMS were utilized since most of this data was generated electronically as applications were scanned into the imaging system, but this data were cross-checked with the data from Screen 217 which was hand entered by Admissions Counselors. If a 0 was assigned, the parents' education level was unreported. There were 133 students included in the analysis who did not report either parent's education level. If a 1 was assigned, it indicated neither parent went to high school. A 2 indicated that at least one parent went to high school. A 3 indicated that at least one parent graduated from high school, but neither went to college. There were 488 students in the fall of 1999 and fall of 2000

reported that neither of their parents' education level was 1, 2 or 3, indicating neither parent ever attended college. A 4 indicated that at least one parent attended college, but neither graduated from college. A 5 indicated that at least one parent completed an undergraduate degree. A 6 indicated that at least one parent completed a graduate degree. There were 3,841 students whose parents attended college.

Some researchers indicated that there may be other non-cognitive characteristics of non-traditional or minority students that can indicate the potential for success (White and Sedlecek, 1986; Tracey and Sedlecek, 1987a, 1987b; Ting and Robinson, 1988; Ting, 1998; Ting, 2000) . These included participation in leadership and community service activities. Students in this study self-reported leadership and community service activities in their applications. Each application was reviewed and assigned scores by two Admission Counselors. There were 3,832 students who received 1-9 points for leadership, and 4,204 who received 1-4 points for service.

Living in a residence hall on campus has been shown to contribute to the retention of freshmen (Pascarella and Terenzini, 1980, 1981; Pascarella, 1985; Astin, 1993). Data were generated from SIMS to determine which students lived on campus. There were 3,098 students who lived on campus and 1,364 students who lived off campus. Students who lived on campus were coded as 1 and students who did not were coded as 0.



Data were generated from SIMS to identify the college in which the student was enrolled the first semester. The distribution is shown in Table 2 .

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**TABLE 2**  
First-semester Colleges for Students Admitted With Review Points

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Agriculture and Life Sciences	403
Architecture	87
Business	590
Education	243
Engineering	638
Geosciences	33
General Studies	1,380
Liberal Arts	538
Science	236
Veterinary Medicine	314
Total	4,462

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Researchers have shown that choice of major can have an impact on retention (Astin, 1993) and that there are variations in grading practices across disciplines (Strenta and Elliot, 1987; Pennock-Roman, 1990). Some disciplines include more difficult and more competitively graded courses in the freshman year curriculum than others.

## Data Analyses

The data for this study were entered into a database, utilizing SPSS version 11.0. Since the entire population of students admitted through the review process for these two years was included in the study, descriptive statistics were appropriate for providing insight into variations across subgroups of the population. This provided the opportunity to look at individual group characteristics and patterns of success or failure.

The dependent variable in this analysis was retention to the second fall at Texas A&M and was a dichotomous variable. Logistic regression allowed for the dependent variable in the analysis to be binary (yes or no) and for the independent variables to be continuous and/or categorical (G. Garson, 2002). The use of logistic regression provided the opportunity to see the relationship among and between the dependent variable and the independent variables (Menard, 2002). Using maximum likelihood estimation, logistic regression was used to generate odds ratios for each of the independent variables through the use of logistic regression coefficients (SPSS, 2001). Maximum likelihood estimation was the iterative process used to maximize the log likelihood to see how much the values of the independent variable could be used to predict values of the dependent variable. The odds ratio was the measure in which the odds for one variable were divided by the odds for another variable. Odds ratios work with categorical variables and do not assume that variables must be in a normal distribution (G. Garson, 2002). Odds ratios can be used to indicate that as an independent variable is

changed by one increment, the odds of belonging to a category of the dependent variable may increase or decrease by a factor of the odds ratio.

## Summary

This study utilized SPSS version 11.0 in the analyses of the dataset of students whose admission to Texas A&M in the fall of 1999 and the fall of 2000 was based upon objective and subjective review points. The study sought to identify relationships between and among academic and non-academic variables as they relate to retention of freshmen at Texas A&M University. Descriptive statistics were utilized to identify characteristics of the population and subsets of the population. In order to determine the relationships between and among the variables in the study, the use of logistic regression allowed for various models to be compared to the full model utilizing significance in terms of  $X^2$ , Adjusted  $R^2$ , and Likelihood-Ratio  $\chi^2$ .

## CHAPTER IV

### ANALYSES OF DATA

#### Research Question

The research question defined for this study was: What are the relationships between and among the pre-admission factors of gender, ethnicity, educational level of parents, high school type, rank in high school class, SAT scores, level of involvement in leadership and community service, and post-admission factors of choice of college for the first semester, choice of residence on campus, and first-year retention of freshmen at Texas A&M University?

The relationships were analyzed using descriptive statistics and logistic regression. The data were analyzed using SPSS 11.0 software. Logistic regression was utilized because the dependent variable, one-year retention, was a dichotomous variable, and the independent variables included some variables that were continuous and some that were categorical (Garson, 2002; George and Mallery, 2003). Maximum likelihood estimation was the iterative process used to maximize the log likelihood to see how well values of the independent variables could be used to predict the odds of belonging to one of the dependent variable groups. Odds ratios were determined and they indicated that for every increment in change of the independent variable the odds of belonging to one of the two categories, yes or no, of the dependent variable increased or decreased by a factor of the odds ratio.

## Population

There were 6,695 new freshmen who enrolled in the fall of 1999, and 6,685 in the fall of 2000. Data on all admitted freshmen were provided by the Student Information Management System's (SIMS) Office and was subsequently cross-checked with a dataset provided by the Office of Institutional Studies and Planning that included information on the education level of the students' parents.

The purpose of this study was to analyze the relationships between and among all of the variables in the research question. Some of the students in the original data set were automatically admitted because of highly competitive credentials without being assigned review points, and these students were removed. International students were removed from the data set because they were admitted based upon different admission criteria. Five students were removed from the data set because they were deceased.

The population for this study included the 4,462 remaining students who were admitted to Texas A&M University through the academic review process based upon the total points awarded through the assignment of two sub-scores, and who subsequently enrolled in the fall semesters of 1999 and 2000. The objective sub-score reflected elements of each student's academic history. A predicted GPR for the freshman year based upon test scores and high school rank was combined with points awarded for advanced

courses in math, science, and language for a possible total of 40 objective points. A subjective sub-score reflected non-academic information each student self-reported in the application that included leadership and service activities. Students could be awarded 0-9 points for leadership and 0-4 points for service. Parents' education level was also part of the subjective score and was coded from 0-6. When these and other subjective points were assigned, there were 60 possible points.

One complication encountered was in regard to the codes related to parent education level. That data was posted on SIMS in two different places through two different processes. The two scores posted by the Admissions Counselors were hand-posted, averaged, and they ranged from 0-6. On this scale, the lowest level of parent education was assigned a code of 6. Each application was reviewed by at least two Admission Counselors. Human error was reflected by different scores being posted for the same parents. Most of the codes posted by the Application Processing Office were posted electronically from applications that were submitted electronically. The room for human error was less because most students submitted applications electronically. In this process, the parent education level was coded 0-6, but because of the way they were loaded from the application, parents with the highest education level were assigned a 6. It was decided to utilize the data from the Application Processing field in SIMS that was subsequently provided

by the Office of Institutional Studies and Planning. A cross-check was conducted to minimize missing data and maximum accuracy.

### Descriptive Statistics

Demographic characteristics of the population are displayed in Table 3.

**TABLE 3**  
Gender, Ethnicity, Parents' Education Level, Targeted/Non-targeted High School

	Parents' Education Level							Non-Targ.	Targ.	N
	0	1	2	3	4	5	6	HS	HS	
African Amer	7	---	4	21	31	37	21	23	98	121
Female	5	---	4	14	21	23	10	11	66	77
Male	2	---	---	7	10	14	11	12	32	44
Hispanic	17	21	20	62	108	98	104	85	345	430
Female	8	7	6	23	55	46	47	35	157	192
Male	9	14	14	39	53	52	57	50	188	238
Nat. Amer.	---	---	1	3	6	12	8	3	27	30
Female	---	---	---	2	4	5	5	2	14	16
Male	---	---	1	1	2	7	3	1	13	14
Asian	8	12	6	10	29	45	47	7	150	157
Female	5	8	3	4	14	19	23	5	71	76
Male	3	4	3	6	15	26	24	2	79	81
White	99	1	21	300	774	1389	1083	101	3556	3667
Female	37	---	7	143	423	658	501	41	1728	1769
Male	62	1	14	157	351	731	582	60	1838	1898
Not Reported	4	---	3	3	19	15	15	7	50	57
Female	2	---	3	1	8	8	10	2	28	30
Male	2	---	---	2	11	7	5	5	22	27
Total	133	34	55	399	967	1596	1287	226	423	4462

0=Not Reported; 1=No High School; 2=Some High School; 3=HS Diploma/G.E.D.; 4=Some College; 5=Undergraduate Degree; 6=Graduate Degree

Within the population, 82.2 percent of the students were White, 9.6 percent were Hispanic, 3.5 percent were Asian, 2.7 percent were Black, 1.3 percent did not report ethnicity and 0.7 percent were Native American. Males comprised 51.6 percent and females comprised 48.4 percent of the population. The students who had one or both parents with an undergraduate or graduate degree comprised 64.6 percent of the population. Another 21.7 percent had at least one parent who attended college, 10.9 percent had parents who never attended college, and 3 percent did not report parents' education level. There were 226 who graduated from high schools designated as targeted schools, and 4236 graduated from high schools designated as non-targeted schools.

The analysis began by determining retention rates in terms of each of the independent variables. The independent variables were grouped into four categories. These were pre-admission demographic variables, pre-admission cognitive variables, pre-admission non-cognitive variables, and post-admission campus variables.

Retention rates for the demographic variables are provided in Table 4. There was a higher retention rate for females than for males. Of those with known ethnicity, Whites had the highest retention rates, with 85.8 percent. Asians were retained at a rate of 85.4 percent, Blacks at a rate of 80.2 percent, and Hispanics at a rate of 77.7 percent. Native Americans were retained at a rate of 76.7 percent, although there were just 30 students in this



group. The retention rate for those whose ethnicity was unknown was 89.5 percent. There were 57 students in this group.

---

**TABLE 4**  
One-year Retention Rates for Freshmen Sorted by Demographic Variables

---

	N	% Retained
Total Students	4462	84.8
Gender		
Female	2160	86.3
Male	2302	83.4
Ethnicity		
Black	121	80.2
Hispanic	430	77.7
Nat. Amer.	30	76.7
Asian	157	85.4
White	3667	85.8
Not Reported	57	89.5
Parents' Ed. Level		
Not Reported	133	61.7
No High School	34	58.8
Some High School	55	87.3
H.S. Dipl. or GED	399	76.7
Some College	967	82.9
Undergrad. Degree	1569	88.2
Grad. Degree	1278	87.4
High School		
Targeted	226	66.8
Not targeted	4236	85.7

---

Retention rates for students whose parents had no high school were the lowest retention rates at 58.8 percent. The next lowest at 61.7 percent were for those students who did not report their parents' education level. Retention rates jumped at least 15 percent for the other categories of parents'

education level. The highest retention rate was for students who had at least one parent with an undergraduate degree.

Retention for students from targeted schools was lower than those from non-targeted schools. The retention rate for students who attended non-targeted high schools was 85.7 percent, and the rate was 66.8 percent for those from targeted high schools.

Retention rates for students sorted by the pre-admission cognitive variables are provided in Table 5. There were 4,159 students whose high school assigned a rank in class. There were 303 students who were only designated by a high school quarter. The mean percentile rank in high school class was 71.3 for those who were ranked, and the standard deviation was 22.8. When the students were grouped into quartiles based upon high school rank, retention ranged from 81.6 percent for the first quartile to 85.7 percent for the fourth quartile. The score range for quartiles of high school rank and SAT scores is included as Appendix B.

When the students were grouped by their quarter in the high school class, those in the top quarter were retained at a rate of 85.9 percent, those in the second quarter at 83.1 percent, those in the third quarter at 74.6 percent, and the 8 students in the fourth quarter at 100 percent. It should be noted that 67.9 percent of the population were in the top quarter of their high school class.

TABLE 5  
One-year Retention Rates for Freshmen Sorted by Pre-admission Cognitive Variables

	N	% Retained
Total Students	4462	84.8
Quartiles Of H.S. Rank		
Total With Rank	4159	84.7
First Quartile	860	81.6
Second Quartile	1185	85.6
Third Quartile	1082	85.2
Fourth Quartile	1032	85.7
Quarter In H.S. Class		
Total With Quarter	4462	84.5
Bottom Quarter	8	100.0
Third Quarter	126	74.6
Second Quarter	1298	83.1
Top Quarter	3030	85.9
Quartiles Of SAT		
First Quartile	1204	81.6
Second Quartile	1075	86.0
Third Quartile	1098	85.3
Fourth Quartile	1085	86.5
Mean SAT	1115.7	
Std. Dev.	107.6	
Mean HSR	71.3	
Std. Dev.	22.8	

For the analysis of the descriptive statistics, each ACT score was converted to an equivalent SAT score, and then all scores were divided into quartiles. The chart for converting ACT scores to SAT scores from the Educational Testing Service is included as Appendix A. The mean SAT score for the group was 1115.7 and the standard deviation was 107.6. Retention

rates ranged from 81.6 percent for those in the first quartile to 86.5 percent for those in the fourth quartile.

In the admission review, subjective criteria on which students were evaluated included self-reported leadership and service activities. These scores were the pre-admission non-cognitive variables. Retention rates for those in the four quartiles for leadership are presented in Table 6. They ranged from 82.6 percent for the first quartile to 87.6 percent for the fourth quartile.

---

**TABLE 6**  
One-year Retention Rates for Freshmen Sorted by Pre-admission Non-cognitive Variables

---

	N	% Retained
<hr/>		
Quartiles Of Leadership Pts.		
First Quartile	916	82.6
Second Quartile	1139	83.6
Third Quartile	1144	84.5
Fourth Quartile	1263	87.6
N-tiles Of Service Pts.		
First N-tile	1699	83.5
Second N-tile	1388	87.3
Third N-tile	1375	83.9

---

Possible scores for service were 0-4, and the population was divided into three n-tiles. Retention rates for the top and bottom n-tiles were less than a percentage point apart, and the middle n-tile was retained at a higher rate

than the other two n-tiles. The score range for quartiles of leadership and n-tiles of service points is included in Appendix B.

Two post-admission variables were included in the analysis. One was residence on or off campus, and the other was the college in which the student first enrolled. Retention rates for these variables can be found in Table 7. Of the 4,462 students, 3,100 lived on campus and 1,362 lived off campus. The difference in retention between those students who lived on campus or off campus was 1.1 percent. Retention rates for the colleges ranged from 76.3 percent for freshmen in the College of Science to 95.4 percent for freshmen in the College of Architecture.

---

**TABLE 7**  
One-year Retention Rates for Freshmen Sorted by Post-admission Variables

---

	N	% Retained
Total	4462	84.8
College Residence		
On Campus	3100	85.1
Off Campus	1362	84.0
College of First Fall		
Agriculture	403	90.3
Architecture	87	95.4
Business	590	89.2
Education	243	88.5
Engineering	637	78.3
General Studies	1381	85.0
Geosciences	33	81.8
Liberal Arts	538	84.8
Science	236	76.3
Vet. Medicine	314	82.5

---

Retention rates sorted by gender and the other variables can be found in the next four tables. The demographic variables sorted by gender are listed in Table 8. The range of retention rates for females was 75.0 to 90 percent. The range of retention rates for males was 78.6 to 88.9 percent .

---

**TABLE 8**  
One-year Retention Rates for Freshmen Sorted by Gender and Demographic Variables

---

	% Retained by Gender	
	Female	Male
<hr/>		
Ethnicity		
Black	80.5	79.5
Hispanic	76.6	78.6
Nat. Amer.	75.0	78.6
Asian	81.6	88.9
White	87.8	83.3
Not Reported	90.0	88.9
Parents' Ed. Level		
Not Reported	60.0	62.8
No H.S.	53.3	63.2
Some H.S.	87.0	87.5
H.S. Grad.	78.1	75.7
Some Col.	84.4	81.2
Bach. Deg.	89.9	86.7
Grad. Deg	89.1	85.9
Type of High School		
Non-targeted	87.1	84.5
Targeted	68.5	65.4
Mean SAT	1101.4	1129.1
Std. Dev.	102.0	110.8
Mean HSR	72.8	69.8
Std. Dev.	23.3	22.2

---

Males whose parents' education level was not reported, males whose parents did not go to high school, and males whose parents attended high school but did not graduate were retained at higher rates than their female peers. Females were retained at higher rates than males if their parents' education level was listed as high school graduate or above.

The retention rates for females were higher than males at both targeted and non-targeted high schools. Females from non-targeted high schools were retained at a rate that was 18.3 percent higher than those from targeted schools. Males from non-targeted high schools were retained at a rate that was 19.7 percent higher than those from targeted high schools.

Females were retained at a higher level than males in the first, second, and fourth quartiles of rank in their high school class as shown in Table 7. Males were retained at a higher level in the second quartile, but the difference was small. The retention rates increased for each quartile for females. For males, it increased from the first to second quartile, but decreased for the top two quartiles.

A comparison of one-year retention rates sorted by gender and pre-admission cognitive variables was presented in Table 9. Retention rates for females were higher than males in the first, third, and fourth quartiles of high school rank. The retention rate for females in the first quartile was the highest for both males and females. The highest retention rate for males was for students in the second quartile.

The retention rate was 100 percent for the eight students in the bottom quarter of their high school class. Students from the fourth quarter were rarely admitted unless they went to competitive college preparatory schools or private high schools. In the top three quarters, retention rates for females at each level were higher than retention rates for males, and retention rates increased as high school quarter increased for both males and females.

---

**TABLE 9**  
One-year Retention Rates for Freshmen Sorted by Gender and Pre-admission Cognitive Variables

---

	% Retained by Gender	
	Female	Male
<hr/>		
High School Rank		
In Quartiles		
First Quartile	84.3	80.3
Second Quartile	85.5	85.7
Third Quartile	86.5	83.7
Fourth Quartile	87.5	83.5
Quarter of Rank		
In High School Class		
Bottom Quarter	100.0	100.0
Third Quarter	76.7	74.0
Second Quarter	83.9	82.7
Top Quarter	87.1	84.4
SAT Scores		
In Quartiles		
First Quartile	81.2	82.2
Second Quartile	87.9	84.0
Third Quartile	88.1	82.7
Fourth Quartile	89.9	84.7

---



Retention rates for females sorted by quartiles of SAT scores ranged from 81.2 percent to 89.9 percent, and consistently increased for each quartile. The retention rate for females was lower than males in the first quartile, but rates for females were higher in the other quartiles. The highest retention rate for males was for students in the fourth quartile.

Data for gender and pre-admission non-cognitive variables was presented in Table 10. Students were grouped into quartiles of leadership points. These points were assigned during the admission review process based upon information the student reported in the application.

---

**TABLE 10**  
One-year Retention Rates for Freshmen Sorted by Gender and Pre-admission Non-cognitive Variables

---

	% Retained by Gender	
	Female	Male
<hr/>		
Leadership Points In Quartiles		
First Quartile	81.7	83.2
Second Quartile	84.8	82.5
Third Quartile	86.2	82.7
Fourth Quartile	89.9	85.1
Service Points In N-tiles		
First N-tile	83.8	83.2
Second N-tile	87.7	86.9
Third N-tile	87.4	80.4

---

Retention for females increased incrementally with each increase in quartile. In the top three quartiles, retention for females was higher than retention for males. For males, the second and third quartiles had lower retention rates than the bottom and top quartiles.

The distribution of points awarded for service activities in the admission review process was a narrower range than those for leadership, so students were divided into three n-tiles. Retention rates for females increased with each n-tile, but there was no pattern for males. Males in the third n-tile actually had the lowest retention rate. Retention for females was higher than retention for males at each n-tile.

Retention rates for males and females for the post-admission variables are included in Table 11. Retention rates for females who lived on campus were higher than those who lived off campus. They were also higher than the retention rates for males who lived either on campus or off campus. Retention rates for males who lived off campus were slightly higher than for those on campus. The percentages of females and males who lived off campus were 30.6 and 30.5, respectively.

**TABLE 11**  
**One-year Retention Rates for Freshmen Sorted by Gender and Post-admission Variables**

	% Retained by Gender	
	Female	Male
Residence		
On Campus	87.2	83.2
Off Campus	84.1	83.9
College		
Agriculture	93.2	87.7
Architecture	92.3	96.7
Business	89.8	88.6
Education	89.4	84.4
Engineering	80.2	77.9
Gen. Studies	85.8	84.3
Geosciences	85.7	78.9
Liberal Arts	85.4	83.7
Science	76.4	76.0
Vet. Medicine	84.4	79.1

Retention rates sorted by gender and choice of college are included in Table 11. Retention rates for both male and female science majors in this population were the lowest, followed by engineering and veterinary medicine. The females with the highest retention rate were agriculture majors and the males with the highest retention rate were architecture majors. For all colleges except Architecture, the retention rates were higher for females than they were for males.

Data that are used to compare retention for each ethnic group that is reported to the state is grouped into the next four tables. A comparison of

retention rates sorted by those demographic variables not presented in previous tables is presented in Table 12.

**TABLE 12**  
One-year Retention Rates For Freshmen Sorted by Ethnicity and Demographic Variables

	% Retained by Ethnicity					
	Black	Hisp.	N. Am.	Asian	White	Not Reported
Parents' Ed Level						
Not Reported	71.4	70.6	---	62.5	58.6	100.0
No College	80.0	63.1	75.0	71.4	81.1	83.3
College 80.9	82.9	76.9	90.1	87.1	88.2	
Type of High School						
Non-targeted	85.7	81.2	77.8	88.0	86.1	88.0
Targeted	56.6	63.5	66.7	28.6	72.3	100.0

Some cells had small numbers. These included Black and Asian students and students who did not report ethnicity whose parents' education level was not reported and students of Native American and unreported ethnicity whose parents had no college. Every retention rate for every group of students was higher for those whose parents went to college than for those whose parents never attended college.

Retention rates for students who went to targeted high schools were lower for all ethnicities except for students who did not report ethnicity than the retention rates for students who went to non-targeted high schools. The greatest difference was for Asian students, and the smallest difference was

for Native American students. The difference for White students was 13.8 percent, and the difference for all students was 18.9 percent. There were small numbers in the cells for Native Americans, Asians, and students who did not report ethnicity who went to targeted high schools.

Data for all ethnic groups and the pre-admission cognitive variables can be found in Table 13.

---

**TABLE 13**  
One-year Retention for Freshmen Sorted by Ethnicity and Pre-admission Cognitive Variables

---

	% Retained by Ethnicity					
	Black	Hisp.	N. Am.	Asian	White	Not Reported
<hr/>						
High School Rank						
In Quartiles						
First Quartile	77.3	72.6	85.7	100.0	82.1	92.9
Second Quartile	78.0	75.9	77.8	82.5	87.3	85.7
Third Quartile	80.0	80.0	83.3	81.1	86.1	100.0
Fourth Quartile	84.6	83.1	40.0	85.3	86.3	81.3
Quarter of Rank						
In High School						
Bottom Quarter	---	100.0	---	---	100.0	---
Third Quarter	66.7	63.6	100.0	100.0	76.0	100.0
Second Quarter	75.7	73.8	80.0	87.2	84.1	94.7
Top Quarter	82.7	80.4	72.2	84.3	86.7	86.5
SAT Scores						
In Quartiles						
First Quartile	81.5	72.0	80.0	81.8	83.5	100.0
Second Quartile	81.5	78.9	100.0	84.8	86.7	100.0
Third Quartile	72.0	85.5	66.7	82.1	86.2	77.8
Fourth Quartile	86.7	83.1	71.4	92.7	86.5	87.5
Mean SAT	1068.8	1066.2	1153.0	1115.3	1122.6	1126.8
Std. Dev.	118.5	112.6	130.6	115.7	104.1	103.6
Mean HSR	75.7	71.7	63.8	74.8	71.0	68.9
Std. Dev.	14.4	20.5	28.6	17.9	23.4	26.0

---

A chart showing frequencies in the cells is included in Appendix C.

Retention rates for Black and Hispanic students increased for each quartile of high school rank, with a range of 77.3 percent to 84.6 percent for Black students, and a range of 72.6 to 83.1 percent for Hispanic students.

Retention rates for Asians actually decreased from the first quartile to the second quartile, and then increased from the second to the fourth. All 23 Asian students in the first quartile were retained. It can be noted that 21 of these students were in the top half of their high school class, none were from targeted high schools, all had parents who had attended at least some college, and only two of the students were Engineering or Science majors.

The difference between retention rates for Whites in the top three quartiles was less than 2 percent. The retention rate for the second quartile may have been higher due to the increase from the first to second quartile in the retention rate for White males which then declined for the third and fourth quartile. Retention rates for White females were almost identical for the second, third and fourth quartile, but their representation compared to males topped out at 56.1 percent for females in the fourth quartile.

When retention rates were sorted by ethnicity and quarter of high school class, Black, Hispanic, and White students were retained at higher levels if they were in the top quarter of their high school class. Retention rates decreased from the second to the top quarter for Native Americans,

Asians and students of unknown ethnicity. Retention rates for Native American, Asian, and students of unknown ethnicity who were in the second quarter reflected numbers small enough that a change in the status of two students for each ethnic group would have increased first-quarter retention rates above second-quarter rates. All cells with 100% retention reflected very small n's.

Black and Asian students in the top quartile of SAT scores had the highest rates of retention within their ethnicities, but the pattern did not hold true for other ethnicities. Hispanic, Asian, and White students in the bottom quartile had the lowest retention rates within these ethnicities. Retention rates for White students in each of the top three quartiles were almost identical, with the retention rate for White students in the second quartile slightly higher than for those in the fourth quartile. This may have been driven by gender. Of the 894 white students in the first quartile of test scores, 56.5 percent were women. Of the 903 white students in the second quartile, 52.9 percent were women. The percentages of females and males were almost equal in the third quartile, and in the fourth quartile, 62.1% of the students were male. The only quartile in which male retention rates were higher than female retention rates was the first quartile. Therefore, in the second quartile, there was both a higher representation of females, and females had higher retention rates. At 90.6 percent, the females in the fourth quartile had the highest retention, but their under-representation reduced the impact on

retention rates for students with fourth quartile of test scores. A similar drop from third to fourth quartile was also present for Hispanic students, but this was driven more by small numbers. There was a 10 percent drop in retention for the 17 females in the fourth quartile as compared to the 39 females in the third quartile.

Data for the non-cognitive pre-admission variables sorted by ethnicity are presented in Table 14. The only two ethnicities that had higher retention for each higher quartile of leadership points were Hispanics and Whites. However, these groups accounted for almost 92 percent of the population.

---

**TABLE 14**  
One-year Retention Rates for Freshmen Sorted by Ethnicity and Pre-admission Non-cognitive Variables

---

	% Retained by Ethnicity					
	Black	Hisp.	N. Am.	Asian	White	Not Reported
<hr/>						
Leadership Pts. In Quartiles						
First Quartile	82.4	72.0	100.0	81.1	83.9	87.5
Second Quartile	83.9	78.5	50.0	83.8	84.3	90.0
Third Quartile	75.8	73.3	66.7	90.7	85.5	92.9
Fourth Quartile 80.0	85.6	84.6	85.0	88.3	88.2	
ServicePoints In N-tiles						
First N-tile	74.5	74.6	57.1	84.1	84.9	91.3
Second N-tile	83.7	85.5	78.6	87.5	87.6	100.0
Third N-tile	85.2	73.0	88.9	85.4	84.8	82.6

---



The results from a cross-tabulation with ethnicity and n-tiles of service points for one-year retention were mixed. The only two groups with gains in retention for each higher quartile of service points were Blacks and Native Americans.

Data for two post-admission variables sorted by ethnicity is presented in Table 15. For those students who lived on campus, one-year retention rates were higher for all ethnicities except for White students. For White students, retention rates were almost identical for those who lived on campus and off campus.

---

**TABLE 15**  
One-year Retention Rates for Freshmen Sorted by Ethnicity and Post-admission Variables

---

		% Retained by Ethnicity					
		Black	Hisp	N. Am.	Asian	White	Not Reported
Residence							
	On Campus	83.1	79.3	90.0	86.7	85.7	91.3
	Off Campus	73.7	74.0	50.0	83.1	85.9	81.8
College							
	Agriculture	100	90.9	0.0	100.0	90.1	100.0
	Architecture	100	85.7	--	100.0	97.3	50.0
	Business	100	81.3	83.3	77.3	90.0	100.0
	Education	100	62.5	---	66.7	89.5	100.0
	Engineering	60.9	73.8	80.0	90.6	78.7	100.0
	Gen. Studies	81.0	72.8	87.5	87.7	86.2	100.0
	Geosciences	---	75.0	--	--	84.6	75.0
	Liberal Arts	72.2	81.3	100	91.7	85.3	85.7
	Science	83.3	80.0	0.0	66.7	77.1	50.0
	Vet. Medicine	88.9	84.1	66.7	76.9	82.3	100.0

---

Retention rates for students of various ethnicities in the nine colleges and the General Studies major ranged from 50-100%, although there were several cells with small numbers. A chart indicating frequencies is included in Appendix C. African Americans were retained at the lowest rate in the College of Engineering, with 23 students enrolled the first semester. They were all retained in the Colleges of Agriculture, Architecture, Business and Education, with 5, 2, 15, and 1 student, respectively. The lowest retention rate for Hispanics was for the 8 students in the College of Education. The highest retention rate for Hispanics was for the 22 students in the College of Agriculture.

There were small numbers of Native American students in all of the colleges. Their highest retention rate was for students in the College of Liberal Arts and the lowest rate was for students in the Colleges of Agriculture and Science. All eight Asian students in the Colleges of Agriculture and one Asian student in Architecture were retained. Of the 32 Asian students in the College of Engineering, 90.6 percent were retained. This was the highest retention rate for any group in Engineering except for the small group of students who did not report ethnicity. Asian students were retained at the lowest levels in the Colleges of Education and Science, with 3 and 9 students, respectively. The lowest retention rate for Whites was for those in the College of Science and Engineering, and the highest was for those in the College of Architecture, followed by Agriculture and Business. Only 6 of 57 students

who did not report ethnicity were not retained. They were in the Colleges of Architecture, Geosciences, Liberal Arts and Science.

Retention rates sorted by the parents' level of education is addressed in Tables 14-18. The type of high school was the one demographic variable not included in previous tables, and is presented in Table 16.

---

**TABLE 16**  
One-year Retention Rates for Freshmen Sorted by Parents' Education Level and Type of High School

---

	% Retained by Parent Education Level		
	Not Reported	No College	College
Type of High School			
Non-targeted	61.7	79.9	87.2
Targeted	60.0	55.4	71.8

---

Retention rates were lower at every level of parents' education level for students who attended targeted high schools when compared to their peers at non-targeted schools. The difference for students whose parents' education level was unreported was 1.7 percent, but there were only 5 students in the group from targeted high schools. The difference in retention rates for students from targeted high schools, comparing those whose parents did or did not have college, was 16.4 percent. This was more than double the

difference in retention rates for students from non-targeted high schools with parents who did or did not have college.

Retention rates for students sorted by parents' education level and pre-admission cognitive variables can be found in Table 17.

---

**TABLE 17**  
One-year Retention Rates for Freshmen Sorted by Parents' Education Level and Pre-admission Cognitive Variables

---

	% Retained by Parents' Education Level		
	NotReported	No College	College
<hr/>			
High School Rank			
In Quartiles			
First Quartile	60.0	69.1	77.8
Second Quartile	62.9	77.8	87.3
Third Quartile	65.2	73.8	87.3
Fourth Quartile	59.3	81.8	87.0
Quarter of Rank			
In High School Class			
Bottom Quarter	---	100.0	100.0
Third Quarter	55.6	63.6	77.4
Second Quarter	65.2	72.2	85.3
Top Quarter	60.3	78.9	87.5
SAT Scores			
In Quartiles			
First Quartile	52.9	70.7	85.0
Second Quartile	50.0	83.8	87.6
Third Quartile	76.0	80.2	86.1
Fourth Quartile	70.0	77.3	87.7
Mean SAT	1122.8	1070.5	1121.2
Std. Dev.	120.2	110.3	105.4
Mean HSR	68.4	74.3	71.0
Std. Dev.	23.7	18.2	23.3

---

The students whose parents had college were retained at higher levels across all quartiles of high school rank, the top three quarters of high school rank, and all quartiles of SAT scores. There were only eight students in the bottom quarter of their high school class, and all eight were retained. Students who did not report parents' level of education had the lowest retention rates across all pre-admission cognitive variables.

There is a consistent progression from lower to higher retention rates in Table 18 for students in each higher quartile of leadership points for students who reported their parents' education level, but the retention rates for students whose parents did not go to college was approximately 10 percent less at each quartile.

---

**TABLE 18**  
One-year Retention Rates for Freshmen Sorted by Parents' Education Level and Pre-admission Non-cognitive Variables

---

	% Retained by Parents' Education Level		
	Not Reported	No College	College
<hr/>			
Leadership Points In Quartiles			
First Quartile	71.9	74.4	84.6
Second Quartile	54.2	75.2	85.2
Third Quartile	55.9	78.1	86.2
Fourth Quartile	62.8	78.8	89.7
Service Points In N-tiles			
First N-tile	63.8	75.4	85.8
Second N-tile	63.9	78.0	88.9
Third N-tile	56.4	78.0	85.2

---

Students in all leadership quartiles who did not report parents' education level had the lowest retention rates. For both groups who reported parents' education levels, retention rates increased with each increase in quartile for leadership points. Increases in n-tiles for service points did not show consistent increases in retention.

In Table 19, when the students were sorted by parents' education level and choice of college, there were fewer than ten students in each of the Colleges of Architecture, Education, Geosciences, Science, and Veterinary Medicine who did not report their parents' education level.

---

**TABLE 19**  
One-year Retention Rates for Freshmen Sorted by Parents' Education Level and Post-admission Variables

---

		% Retained by Parents' Education Level		
		Not Reported	No College	College
Residence				
	On Campus	58.0	78.7	86.8
	Off Campus	68.9	72.5	86.2
College				
	Agriculture	85.7	81.1	92.0
	Architecture	100.0	100.0	94.7
	Business	66.7	80.0	91.2
	Education	60.0	75.0	90.4
	Engineering	53.6	72.1	80.7
	Gen. Studies	63.2	75.0	87.0
	Geosciences	100.0	50.0	83.3
	Liberal Arts	54.5	84.1	85.5
	Science	25.0	63.6	78.6
	Vet. Medicine	44.4	77.1	84.4

---

The students in the remaining colleges who did not report their parents' education level had the lowest retention rates when compared to the two other parent categories except for those in the College of Agriculture.

There were only ten students in Architecture and two students in Geosciences whose parents had no college. For the rest of the colleges, retention rates for this group of students ranged from 63.6 percent for students in the College of Science to 84.1 percent for students in the College of Liberal Arts. For the group of students whose parents had college, retention rates ranged from 78.6 percent for students in the College of Science to 94.7 percent for students in the College of Architecture. The retention rate for students who did not report parents' education level was 10.9 percent higher for those who lived off campus than for those on campus. The retention rate for students whose parents had no college who lived off campus was 6.2 percent lower than for those on campus. The difference in retention rates for students whose parents had college was less one percent for on-campus and off-campus students.

Retention rates for students from non-targeted and targeted high schools were sorted by pre-admission cognitive variables, pre-admission non-cognitive variables and post-admission variables in Tables 20, 21 and 22. In Table 20, retention rates were presented for the pre-admission demographic

variables. There were small numbers in the cells for students in the third and fourth quarter of their high school class at targeted high schools.

Except for students in the bottom quarter of their high school class, retention rates for students from non-targeted high schools were shown to be higher in all categories of high school quartile, high school quarter and SAT quartiles when compared to their peers at targeted high schools.

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**TABLE 20**  
One-year Retention Rates for Freshmen Sorted by Type of High School and Pre-admission Cognitive Variables

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	% Retained by Type of High School	
	Targeted High School	Non-targeted High School
<hr/>		
High School Rank		
In Quartiles		
First Quartile	81.8	77.8
Second Quartile	86.9	60.3
Third Quartile	86.9	59.7
Fourth Quartile	86.5	74.3
Quarter Of Rank		
In High School Class		
Bottom Quarter	100.0	100.0
Third Quarter	75.0	50.0
Second Quarter	83.9	62.2
Top Quarter	87.0	68.0
SAT Scores in Quartiles		
First Quartile	83.8	65.7
Second Quartile	86.4	73.3
Third Quartile	85.9	66.7
Fourth Quartile	86.9	65.0
Mean SAT	1120.4	1026.9
Std. Dev.	105.1	114.8
Mean HSR	70.8	79.6
Std. Dev.	23.2	9.8

---



There was no consistent increase in retention for a corresponding increase in quartile of high school rank for students from either non-targeted or targeted schools. With the exception of the small group of students in the bottom quarter of their high school class, retention rates increased for students at both non-targeted and targeted high schools as quartile of the high school class increased. Students at non-targeted high schools who were in the first quartile of SAT scores had the lowest retention rate, and the highest rate was for students in the fourth quartile. The difference in retention for the second, third, and fourth quartile was less than two percent. The lowest retention rate for students from targeted high schools was for those in the fourth quartile of SAT scores, and the highest was for those in the second quartile.

There are some sizeable disparities in retention rates sorted by type of high school and cognitive variables. As presented in Table 2, overall retention rates for students from targeted high schools was 66.8 percent compared to 85.7 percent for students from non-targeted high schools. The subpopulation of students from targeted high schools had quite different demographic characteristics than students from non-targeted high schools. Only 43.8 percent of the students from targeted high schools were Anglo compared to 82.1 percent of the population. The targeted group was 57.5

percent male, and 31 percent of the targeted group's parents did not go to college as compared to 13.9 percent of the population.

Retention rates for students from targeted high schools who were in the second and third quartile of high school rank were 26.6 percent and 27.2 percent lower than their peers from non-targeted high schools. This gap narrowed to 12.2 percent for students from targeted schools who were in the fourth quartile of high school rank. The gaps for students who ranked in the top quarter and second quarter of their high school class were 19.0 and 21.7 percent. The drop in retention rates for students from targeted high schools in SAT score quartiles ranged from 13.1 percent to 21.9 percent.

Retention rates for students at non-targeted high schools increased for each increase of quartile of leadership points in Table 21, although the difference between the lowest and highest retention rates was just 4.2 percent. Retention rates for students from targeted high schools were lower than their peers from non-targeted high schools at all quartiles of leadership points. Their retention rates increased from the first through the third quartiles, but then dropped with the fourth quartile.

When comparing the n-tiles of service points, students in the second n-tile from both types of high schools had the highest retention rates. For all three n-tiles, students from non-targeted high schools were retained at higher levels than students from targeted high schools.

**TABLE 21**  
**One-year Retention Rates for Freshmen Sorted by Type of High School and**  
**Pre-admission Non-cognitive Variables**

	% Retained by Type of High School	
	Non-targeted High School	Targeted High School
Leadership		
First Quartile	84.4	52.9
Second Quartile	84.5	64.7
Third Quartile	84.9	77.6
Fourth Quartile	88.6	69.7
Service		
First N-tile	84.6	67.3
Second N-tile	88.0	70.7
Third N-tile	84.8	61.8

Post-admission variables are included in Table 22. Students from both non-targeted and targeted high schools who lived on campus were retained at essentially the same rate as their high school peers who lived off campus.

There were 3,100 students in the population who lived on campus, and 1,362 students who lived off campus. Of the students who lived on campus, 159 were from targeted high schools, and 67.9 percent of these students were retained. Of those from non-targeted high schools who lived on campus, 86.1 percent were retained. Retention rates for students who lived off campus were 64.2 percent for the 67 students who were from targeted high schools and 85.0 percent of the 1,295 students from non-targeted high schools.

Table 22  
One-year Retention Rates for Freshmen Sorted by Type of High School and Post-admission Variables

		% Retained by Type of High School	
		Non-targeted High School	Targeted High School
Residence			
	On Campus	86.1	67.9
	Off Campus	85.0	64.2
College			
	AG	91.2	77.8
	AR	95.1	100.0
	BU	89.5	75.0
	ED	89.0	71.4
	EN	79.6	57.1
	GEO	85.7	60.0
	GES	86.1	64.8
	LB	85.9	64.3
	SC	77.2	58.3
	VM	85.7	66.8

When sorted by college, there were small numbers in the cells for students from targeted high schools who were in the Colleges of Architecture, Education and Geosciences. Except for students in Architecture, students from non-targeted high schools were retained at higher rates than those from targeted high schools. Students in the College of Engineering who came from targeted high schools had the lowest rate of retention followed by students from targeted high schools in the College of Science. Excluding the colleges with small numbers of targeted students, the highest retention rate for targeted students was for those in the College of Agriculture.

## Logistic Regressions

Logistic regression was used for this analysis because the independent variable was dichotomous (Garson, 2002; George and Mallery, 2003). Students were either retained or not retained. The purpose was to analyze the relationships between and among selected pre-admission and post-admission variables on retention. Some of the dependent variables were continuous and some were categorical.

The Spearman correlation coefficients in Table 23 were run for the variables in this analysis. Spearman correlations were run because some independent variables were ordinal rankings (Hinkle, Wiersman, and Jurs, 1988). It was not known if the distribution was normal (George and Mallery, 2003). A Spearman correlation coefficient would reflect a perfect positive correlation when it equaled +1 and a perfect negative correlation when it equaled -1. All but the correlation between High School Quarter and High School Percentile are relatively weak correlations as indicated by values much closer to zero than to one.

The correlation between High School Quarter and High School Percentile was negative because 1 indicated the highest quarter whereas 1 indicated the lowest percentile. The reason this was not a perfect negative correlation might have been that some students were only assigned a rank for their high school quarter rather than a percentile.

TABLE 23  
Correlation Matrix

Variables	SAT ACT	HS% Rank	HS Quart	Lead	Serv	Parent Ed Level
SAT/ACT	1.00					
HS% Rank	-0.06*	1.00				
HS Quarter	0.08*	-0.71*	1.00			
Leadership	-0.06*	0.01	-0.01	1.00		
Service	0.02	-0.11*	0.06*	0.19*	1.00	
Parent Ed	0.16*	-0.03	-0.01	0.06*	0.12*	1.00

\* statistically significant at 5% level

The correlation between high school rank and SAT scores was negative and significant, but was very weak, as was the quarter in the high school class and test scores. The very small negative correlation between SAT scores and high school rank reflects that there were almost as many students who had higher scores but did not have high ranks and almost as many students who had lower scores who did not have low ranks. One good example of this was the eight students who were admitted from the bottom quarter of their high school class, but had high enough scores to meet admission requirements. The very small positive correlation between SAT scores and high school quarter likewise indicates that there is not much of a relationship between SAT scores and high school quarter. The reason this correlation is positive and the correlation with SAT and percentile of high

school rank is negative could be that outliers have been collapsed into four quarters.

Leadership had a very small negative correlation with SAT scores. This reflects that there was hardly any pattern of a relationship between high and low leadership points and high and low SAT scores, and what little pattern was there was that there were more students who had a mismatch between SAT scores and leadership points than there were with a match . Service correlated significantly, but weakly, with high school rank and quarter in high school class, and indicated a slightly positive relationship. The correlation between service and leadership was the strongest significant correlation other than that between high school quarter and rank, but was still a weak correlation. It makes sense that there might be a positive correlation because students in leadership positions are often coordinating service events. There were very weak but significant correlations between parents' education level and test scores and parents' education level and service and leadership. The literature supports the concept that students whose parents have higher levels of education tend to do better on tests such as SAT tests than students whose parents have lower levels of education, but there is a wide range of variation of test scores for children of any educational grouping of parents. A similar conclusion can be made that given any grouping of parents, there may be a wide range in the amount of student involvement in leadership and service, but that parents with the highest education levels may

be able to identify more opportunities to involve their children in leadership and service activities.

The weak correlations between the variables indicate that multicollinearity is not likely to distort data about relationships between the variables. Multicollinearity results from strong correlations between independent variables which can alter the statistical significance of individual variables (The Center for Statistical Computing, 2003). If it is possible, variables with strong correlations should be combined or one variable dropped from the model. For this regression, high school percentile was utilized rather than high school quarter.

With logistic regression, B coefficients are determined using maximum likelihood estimation (G. Garson, 2003). The Wald statistic and the degrees of freedom are used to demonstrate the significance of B for each independent variable (George and Mallery, 2003). Results of logistic regression are presented as odds ratios. The  $\text{Exp}(B)$  is the odds ratio for each independent variable. Odds ratios, the probability of an event occurring divided by the probability of it not occurring, are interpreted by stating for every incremental increase in the independent variable, the odds that the variable contributes to a change in the dependent variable go up or down by a specific amount (Whitehead, 2003).



The analysis that explained the effect of independent variables on the dependent variable, which was retention to the second fall at Texas A&M University, is presented in Table 24.

Independent variables were loaded into the logistic regression using the Forward Wald method. The significance of the Wald statistic at a level  $<.05$  indicated that the parameters were useful to the model for three variables (George and Mallery, 2003). These were the test scores, leadership points, and parents' education level.

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**TABLE 24**  
Model of the Effect of Independent Variables on Retention of All Freshmen

---

Predictor Variables	B	Wald	df	Sig.	Odds Ratio
SAT Scores	0.00	9.51	1.00	0.00	1.00
Leadership Points	0.11	12.74	1.00	0.00	1.11
Parents' Education Level	0.25	76.76	1.00	0.00	1.28
Nagelkerke $R^2$ .039					

---

The independent variable that increased the likelihood of retention the most was the parents' education level. For each increase in level of parent education, students were 1.29 times more likely to be retained. For each increase in the points for leadership, students were 1.11 times more likely to be retained. Test scores did little to increase the likelihood of retention. The amount of variance explained was small.

A classification table is a cross-tabulation of the observed and predicted outcomes. It was predicted that all students would be retained in Table 25. The percentage correct was the retention rate for the population.

TABLE 25  
Classification Table for All Students

	<u>Predicted Retention</u>		Percentage Correct
	Not Retained	Retained	
<u>Observed Retention</u>			
Not Retained	0	679	0.0
Retained	0	3783	100.0
Overall Percentage			84.8

Separate models are presented for females and males and for African American, Hispanic, Asian and Anglo freshmen, and for students from targeted high schools. For female freshmen there were three independent variables that were included in the model in Table 26. The three variables in the model were test scores, leadership points, and parents' education level.

The independent variable that increased the likelihood of retention the most was parents' education level. For each increase in education level, female freshmen were 1.32 times more likely to be retained. For each increase in leadership, students were 1.19 times more likely to be retained. SAT scores were in the model, but did little to increase the likelihood of retention. The amount of variance explained was less than seven percent.

Table 26  
Model of the Effect of Independent Variables on Retention of Female Freshmen

Predictor Variables	B	Wald	df	Sig.	Odds Ratio
SAT Scores	0.00	18.78	1.00	0.00	1.00
Leadership Points	0.17	12.83	1.00	0.00	1.19
Parents' Education Level	0.28	38.73	1.00	0.00	1.32
Nagelkerke R <sup>2</sup> .066					

It was predicted in Table 27 that four females would not be retained who were not retained. It was predicted that 293 females would be retained who were not retained, and that 1863 females would be retained. The percentage correct is 86.4 percent. The retention rate was 86.3 percent.

TABLE 27  
Classification Table for Female Freshmen

	<u>Predicted Retention</u>		Percentage Correct
	Not retained	Retained	
<u>Observed Retention</u>			
Not Retained	4	293	1.3
Retained	0	1863	100.0
Overall percentage			86.4

The model for male freshmen is presented in Table 28. Only one independent variable contributed significantly to the model, and that was the parents' education level. The amount of variance explained was very small.

**TABLE 28**  
Model of the Effect of Independent Variables on Retention of Male Freshmen

Predictor Variables	B	Wald	df	Sig.	Odds Ratio
Parents' Education Level	0.23	37.54	1.00	0.00	1.26

For each increase in parents' education level, male freshmen were 1.26 times more likely to be retained. SAT scores, percentile rank in high school class, leadership points, service points, and residence were not included in the model. The classification table for males predicted that all males would be retained, so the percentage correct was the retention rate of 83.4 percent.

There were no independent variables for which the Wald statistic was significant for African American freshmen. The classification table predicted that all African American freshmen would be retained. The number of African American students in the population was small. Even with the variable of parents' education level, the retention rate for students whose parents had no college, at 80 percent for these 25 students, was almost identical to the rate

for students whose parents had attended college, at 80.8 percent for 89 students. Seven students did not report parents' education level.

Three independent variables included in the model for Hispanic freshmen were significant as presented in Table 29.

---

**TABLE 29**  
Model of the Effect of Independent Variables on Retention of Hispanic Freshmen

---

Predictor Variables	B	Wald	df	Sig.	Odds Ratio
SAT Scores	0.00	6.03	1.00	0.01	1.00
Percentile Rank in Class	0.01	7.00	1.00	0.01	1.02
Parents' Education Level	0.24	10.28	1.00	0.00	1.26
Nagelkerke R <sup>2</sup> .083					

---

The three variables were SAT scores, percentile rank in high school class, and parents' education level. For each increase in the parents' education level, Hispanic freshmen were 1.26 times more likely to be retained. Even though SAT scores and percentile rank in high school class were significant, any increase did very little to increase retention. The amount of variance explained was higher than that for several other groups but was only just above eight percent.

In Table 30, the classification table for Hispanic freshmen, 7 freshmen were predicted not to be retained who were retained, and 92 freshmen were

predicted to be retained who were not retained. A prediction that 4 freshmen would not be retained was correct, as was the prediction that 327 freshmen would be retained. The percentage correct was 77.0 percent. The actual retention rate was 77.7 percent.

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TABLE 30  
Classification Table for Hispanic Freshmen

	<u>Predicted Retention</u>		Percentage Correct
	Not Retained	Retained	
<hr/>			
<u>Observed</u>			
Not Retained	4	92	4.2
Retained	7	327	97.9
Overall Percentage			77.0

The model for Asian freshmen is presented in Table 31. Only one variable was included in the model, and that was parents' education level.

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TABLE 31  
Model of the Effect of Independent Variables on Retention of Asian Freshmen

---

Predictor Variables	B	Wald	df	Sig.	Odds Ratio
Parents' Education Level	.343	8.713	1	.003	1.41
Nagelkerke R <sup>2</sup> .094					

---

For each increase in parents' education level, Asian freshmen were 1.41 times more likely to be retained. SAT scores, percentile rank in high school class, leadership points, service points, and residence were not included in the model. The classification table predicted that all Asian freshmen would be retained, so the percentage correct was the same as the 85.4 percent retention rate.

The model for Anglo freshmen is presented in Table 32. Two variables were included in the model. These were leadership points and parents' education level.

---

**TABLE 32**  
Model of the Effect of Independent Variables on Retention of Anglo Freshmen

---

Predictor Variables	B	Wald	df	Sig.	Odds Ratio
Leadership Points	0.11	10.76	1.00	0.00	1.11
Parents' Education Level	0.25	54.71	1.00	0.00	1.29
Nagelkerke R <sup>2</sup> .030					

---

For each increase in the parents' education level, Anglo freshmen were 1.29 times more likely to be retained. For each increase in leadership points, students were 1.11 times more likely to be retained. The amount of variance explained was very small. The classification predicted that all Anglo students would be retained.

The model for students from targeted high schools was presented in Table 33. Only parents' education level was included in the model.

**TABLE 33**  
Model of the Effect of Independent Variables on Retention of Freshmen from Targeted High Schools

Predictor Variables	B	Wald	df	Sig.	Odds Ratio
Parents' Education Level	.311	10.13	1	.001	1.37
Nagelkerke R2 .093					

For each increase in parents' education level, freshmen from targeted schools were 1.37 times more likely to be retained. SAT scores, percentile rank in high school class, leadership points, service points, and residence were not included in the model. The amount of variance explained was the highest of any of the regressions, but was less than ten percent.

Table 34 presents the classification table for freshmen from targeted high schools. There were correct predictions for 10 students not to be retained and for 143 students to be retained. It was predicted that 8 students would not be retained who were retained and 65 students would be retained who were not retained. The percentage correct was 67.7 percent. The actual retention rate was 66.8 percent.



TABLE 34  
Classification Table for Freshmen from Targeted High Schools

	Predicted Retention		Percentage Correct
	Not Retained	Retained	
<u>Observed</u>			
Not Retained	10	65	13.3
Retained	8	143	94.7
Overall Percentage			67.7

### Summary

In general, there are differences in retention rates between different groups of students in the population when sorted by gender, ethnicity, parents' education level, and type of high school. Females had a higher retention rate than males. Anglos had the highest retention rate of the ethnic groups except for the small group of students who did not report ethnicity. Students whose parents had undergraduate degrees had the highest retention rate compared to students whose parents had less education. The retention rate for the small group whose parents did not go to high school was almost 30 percent less than the students whose parents had undergraduate degrees. The retention rate for students who attended non-targeted high schools was almost 20 percent higher than for the students who attended targeted high schools.

When the logistic regressions were run for all students and for the various subgroups, parents' education level was the only independent variable for all models, except for African American students, that had a significance level  $< .05$  that indicated that the parameter was useful to the model. There were no independent variables for which the Wald statistic was significant for African American students. This could just be due to the small numbers when divided into subgroups. There was an overrepresentation of females within the African Americans compared to all other ethnicities, so the group of males whose parents did not attend college only included seven students.

In addition to the variable of parents' education level, the independent variables of SAT scores and leadership points had significance levels of  $< .05$  for the model for all students and for female students, although the odds ratio for SAT was 1.00. In addition to the variable of parents' education level, the independent variables of SAT scores and percentile in high school class had a significance level  $< .05$  for the model for Hispanic students, but the odds ratios for SAT scores and percentile were 1.00 and 1.02. In addition to the variable of parent's education level, the independent variable of leadership points had a significance level of  $< .05$  for the model for Anglo students, and the odds ratio was 1.11.

Of special interest are the disparities in retention rates for students based upon parents' education level, which was the independent variable that

was significant for all models except for African Americans. Of additional interest are disparities in retention rates for students from targeted and non-targeted high schools. The amount of variance explained by all of the models was less than ten percent.

## CHAPTER V

### SUMMARY AND CONCLUSIONS

This study was prompted by a change in admission practices in response to the Hopwood decision {Hopwood v. Texas, 78 F.3d 932 (5<sup>th</sup> Cir. 1996)}. Public universities in Texas could no longer use ethnicity as one of the criteria to be considered in the admission process. Black and Hispanic students were underrepresented in the universities, particularly at the flagship universities. At the same time, they represented a growing percentage of the high school graduates in Texas (Murdock, 1998).

In response to the Hopwood decision, the admission review process at Texas A&M was changed to provide a more holistic review of each student's talents and accomplishments, including both objective academic criteria and subjective non-academic criteria. The admission review process allowed for the Admissions Counselors to review the application and award points for categories including leadership and service activities and parents' education level in addition to traditional criteria such as test scores and rank in high school class. The review process also provided an opportunity for the type of high school, targeted or non-targeted, to be taken into account. Targeted high schools were defined by utilizing multiple indicators from data from the Texas Education Agency that reflected student bodies with large percentages of students from economically disadvantaged backgrounds. Because these

schools had less tax base to draw on, they could not provide the array of advanced courses and AP courses found in their wealthier counterparts.

The Texas Legislature and the Texas Higher Education Coordinating Board set retention of freshmen to the second fall as a performance indicator for colleges and universities. A desired outcome of this performance indicator was that participation in higher education, particularly at flagship schools, would more accurately reflect demographic characteristics of the state. The match between the demographic characteristics of the college-going population and the state could not be maintained if freshmen from various ethnic groups were not retained to the second fall.

This study attempted to analyze patterns of retention for students with various characteristics that were identified in the more holistic admission review process. The purpose was to determine the predictive validity of the academic, non-academic, and demographic variables for retention.

### Research Method

This study was conducted using data from the Student Information System at Texas A&M University. The dataset allowed for an analysis of the freshmen admitted through the admission review process who subsequently enrolled in the Fall of 1999 and the Fall of 2000.

The dependent variable was retention to the subsequent fall at Texas A&M University. The independent variables included gender, ethnicity,

targeted or non-targeted high school, parents' education level, high school rank or quarter, SAT or ACT scores converted to SAT equivalents, points for leadership and service activities during high school, residence on or off campus during the first semester, and choice of college for the first fall.

The study included the use of descriptive statistics and logistic regression. Independent variables were cross-tabulated to determine possible relationships between two independent variables and the dependent variable. A model was created through logistic regression. The odds ratio for significant variables showed the likelihood that an increase in retention could result from incremental increases in the independent variables.

One research question was developed that incorporated all of the independent variables:

#### Research Question

*1. What are the relationships between and among the pre-admission factors of gender, ethnicity, educational level of parents, high school type, rank in high school class, SAT scores, level of involvement in leadership and community service, and post-admission factors of choice of college for the first semester, choice of residence on campus, and retention of freshmen at Texas A&M University?*

## Summary of Findings and Conclusions

The summary and conclusions are presented in five sections. The first addresses issues related to the population. The next four are framed by the demographic independent variables. Within each of the four sections, each of the remaining independent variables are addressed as it relates to the demographic variable.

### *Population*

There are fewer students in this population than originally expected. When admissions decisions were made in 1999, some students who usually were admitted through the admission review process were admitted automatically earlier in the admission cycle based upon a decision by the Assistant Provost for Enrollment Management. This caused the numbers for some small minority groups to be further reduced. It should be noted that student athletes are not admitted through the review process, so their retention rates are not a factor in the retention rates for the small subgroup of African American students. Within the population, 82.2 percent of the students are White, 9.6 percent are Hispanic, 3.5 percent are Asian, 2.7 percent are Black, 1.3 percent do not report ethnicity and 0.7 percent are Native Americans. The population is composed of 51.6 percent males and 48.4 percent females. The retention rate for the population from the first fall to the second fall is 84.8 percent.

For the population, the variables of parents' education level, leadership, and SAT scores contribute significantly to the logistic regression for retention. Parents' education level has the strongest effect of the three variables, the effect of leadership is less, and the effect of SAT scores is almost nonexistent. Parents' education level also contributes significantly for both genders, for Anglo, Hispanic and Asian students, and for students from targeted high schools. This indicates that students whose parents have less education are retained at lower rates, and those whose parents have college experience are more likely to be retained to the second fall, although the variance explained by the regression is very small. Some of the lowest retention rates for any of the individual variables are generated when the data was sorted for students from targeted high schools whose parents' education level is not reported or whose parents did not go to high school. Forty-four percent of these 70 students are not retained to the second fall. First-generation students from high schools in socio-economically disadvantaged areas have more difficulty making the transition to a large, predominantly Anglo university, and can benefit from additional academic, financial and social support.

The independent variable for leadership was selected for this study because it was mentioned in the literature and because it made intuitive sense. The organizational and personal skills required for many leadership positions are the kind of skills that indicate the student might integrate into a



new social environment with more resiliency and might be more likely to initiate problem-solving skills when faced with new and more difficult academic challenges. Points for leadership activity are significant in the regression for all students, for all female students, and for Anglo students, although with odds ratios of 1.11, 1.19, and 1.11, respectively, the effect is modest. Leadership does not contribute to the logistic regression for males or other ethnicities, so the effect of female retention drives the model for all students and Anglo students. This indicates, particularly for Anglo females, that students who have higher points for self-reported leadership activity prior to college are more likely to be retained to the second fall. Therefore, if the goal of the admission process is to select students most likely to be retained to their second fall, ranking the amount and level of leadership activity prior to high school can be justified.

### *Gender*

The population is 48.4 percent female and 51.6 percent male. The retention rate for females is 2.9 percent higher than for males. The mean SAT for males is higher than females, and the mean percentile rank in high school class is higher for females than males. The mean points for females for leadership and service are higher than males. The patterns with scores and ranks are consistent across the subgroups of African American, Asian, and Hispanic males and females with one exception. The mean percentile

rank in high school class for the African American males is higher than females.

Retention rates are higher for the Anglo and African American females and females who do not report their ethnicity than for their male counterparts. The Anglo subgroup is 48.2 percent female and 51.8 percent male. The female retention rate is over four percent higher than the male retention rate. The percent of Anglo males from targeted schools, the percent whose parents did not attend college or report education level are slightly higher than those for Anglo females. The difference in female and male retention rates for the African American subgroup is only one percent. This group was 63.6 percent females and 36.4 percent males. The difference in female and male retention rates for students who did not report ethnicity is just over one percent.

Retention rates for Hispanic, Native American, and Asian females are lower than their male counterparts by 2 percent, 3.6 percent and 7.3 percent, respectively. The review of the independent variables does not shed light on the lower retention rates for Hispanic females. There is a higher percent of Hispanic males whose parents did not go to college compared to Hispanic females, and a higher percent of Hispanic males are from targeted high schools compared to Hispanic females. The mean SAT scores for Hispanic males is only 16 points higher than females, and the difference in percentile rank in high school class for Hispanic females and males is only one percent.

The mean points for leadership is higher for Hispanic females. Therefore, one must conclude that variables not included in this study such as cultural, financial or family issues may contribute to a better explanation for the lower retention rates for Hispanic females.

Among Asian students, the difference in mean SAT scores for males and females is 19 points, and the difference in rank is three percent. One explanation why Asian females were retained at a rate lower than Asian males may be that a higher percent have parents who did not go to college than Asian males, and a slightly higher percent of Asian females are from targeted high schools than Asian males.

Females from targeted high schools are retained at a higher rate than their male counterparts. Females who did not report their parents' education level or whose parents did not have high school diplomas or G.E.D.'s are retained at lower rates than their male counterparts, but females whose parents had high school diplomas or attended college are retained at higher rates than their male counterparts. Parent's education level is the one independent variable that is significant in the logistic regression for both genders. It increases the likelihood of retention the most for females, and the amount of variance explained is higher for females than for males, but even for females the amount explained is small.

For females, performance in high school is a closer match to retention in college than it is for males. Retention rates for females increase with each

increase in quartile of high school rank. For males, those in the second and third quartile are retained at higher rates than those in the top quartile. For both males and females, those in the bottom quartile of high school rank have the lowest retention rates, but the difference is only about two percent between the lowest and highest retention rates. Grouping high school percentiles into quartiles does not illuminate any differences in retention.

There is an increase for both males and females in retention for each increase in high school quarter with the exception of a very small group of eight students in the bottom quarter who are all retained. It is likely the eight students in the bottom quarter were selected for admission because they attended very competitive private high schools or there were special circumstances taken into consideration. Retention rates for females are slightly higher than males in each of the first, second, and third quarters. There are 124 students in the third quarter who likely were also admitted because of special circumstances, but the retention rate for both males and females in the third quarter is more than 10 percent less than those in the top quarter of their class. If the goal of the university is to admit students most likely to be retained, the number of students who are third quarter who are admitted should be kept very low.

For females, there is an increase in retention with each increase of quartile for SAT scores. For both genders, those in the bottom quartile have the lowest retention rates. The range of SAT scores for the first quartile is

from 740 to 1050, and the mean is 984. The difference in the lowest and highest retention rate for females is 8.7 percent with the lowest rate and highest rate respectively lower and higher than the retention rates for males. The difference in the retention rates for males across the quartiles is only 2.5. The lowest retention rate for females is 81.2 percent and for males is 82.2 percent. Splitting test scores into quartiles does little to illuminate differences in retention, particularly for males.

For females, there is an increase in retention with each increase of quartile for leadership points. For males, those in the highest quartile have the highest retention rates, but retention rates for the bottom quartiles are the second highest. If leadership continues to be used in the admission process, giving more weight to the top levels of leadership might contribute to increased retention.

High levels of service activity are not associated with increased retention for either males or females. Both males and females in the second n-tile have the highest retention rates for both males and females. Females in the top n-tile have the second highest retention, but males in the top n-tile have the lowest retention rates. Service points do not contribute to the regression for any of the groups. Participation in service activities may indicate the ability to socially interact, but it does not necessarily indicate an ability to initiate and/or organize activities.

Retention rates for females who lived on campus are three percent higher than females who lived off campus and four percent higher than males who lived on campus. Males who lived off campus have only slightly higher retention rates than males on campus. It is interesting to note that approximately 30 percent of males and 30 percent of females in this population lived off campus, and retention rates for females and males who lived off campus are almost identical. The only subgroups for whom residence on campus increased the percent of students retained substantially more than the whole population are African American females and Hispanic males. Otherwise, residency does not seem to make much difference.

Females in every college except Architecture have higher retention rates than males. For both males and females, students in the curriculums in the Colleges of Agriculture, Architecture and Business have higher retention rates, followed by students in Education and General Studies. Of the population, 60.6 percent are in these majors, including 63.9 percent of the females and 59.2 percent of the males. For both males and females, students in the Colleges of Engineering, Geoscience, Liberal Arts, Science, and Veterinary Medicine have lower retention rates. Four of these five colleges have freshman curriculums that include more math and science classes for which grading practices tend to be rigorous. Therefore, there is a relationship between choice of major, freshman curriculum, grading practices and retention patterns of males and females. A most dramatic example

involves students in the Colleges of Engineering and Science. These students have the two lowest retention rates compared to students in other colleges. There are 873 students in these two colleges, with 602 males and only 271 females.

Most results of this analysis of retention rates sorted by gender are generally consistent with the literature (Stephenson, 2001). Females are retained at slightly higher rates than males. Male and female students from targeted high schools and whose parents had low education levels have lower retention rates. For females, performance in college matches academic and nonacademic performance prior to college more closely than for males. Results in the literature on the effect of on-campus housing are mixed. (Blimming, 1989). In this study, the differences in retention rates for students living on campus and off campus are not great, and retention rates for males are slightly higher for those who lived off campus.

Retention rates for females are higher than for males across all of the colleges except for Architecture. Males are slightly overrepresented in the five colleges with the lowest retention rates. They are heavily overrepresented in the Colleges of Engineering and Science, the two colleges with the lowest retention rates, which may explain much of the difference between retention rates for males and females.

### *Ethnicity*

Retention rates for the various ethnic designations range from 76.7 percent to 89.5 percent. Anglo and Asian students and students who did not report ethnicity have higher retention rates than African American, Hispanic, and Native American students. Among all ethnicities and genders, the only retention rate higher than that for Asian males is for the 31 females who did not report ethnicity who are retained at a rate of 90.3 percent. The retention rate for Asian males is 88.9 percent, and for Asian females is 81.6%.

Within each ethnic group, students whose parents had college degrees are retained at higher rates than those whose parents did not. The largest difference in retention rates is between Hispanic students whose parents did or did not go to college. The difference in retention rates is less than one percent between African American students whose parents did or did not go to college. African American students are the only group for whom parents' education level does not contribute significantly in the logistic regressions for retention. The two highest amounts of variance explained for ethnic groups were for Asian students and Hispanic students, but the highest was less than ten percent.

When students are sorted by both ethnicity and gender, the group with the highest percentage of parents who did not go to college is Hispanic males at 28.1 percent, followed by African American females at 23.3 percent. Of the 25 African American students whose parents did not go to college, 18 are female and only 7 are male. Among Hispanic females, 18.8 percent have



parents who did not go to college. For Asian American students, 19.7 percent of females and 16 percent of males have parents who did not go to college. Among Anglos, 9 percent of males and 8 percent of females have parents who did not go to college. Even with the comparatively low representation of parents with less education among the Anglo population, parents' education level did contribute significantly to the logistic regression for retention. Parents who did not attend college may not be as well equipped to provide financial and emotional support for their students as the students face the challenges of the new environment.

Students who went to targeted high schools are retained at lower rates regardless of ethnicity. Hispanic and Black students who went to targeted high schools are retained at rates that are 17.7 and 29.1 percent less, respectively, than those from non-targeted high schools. Anglo students from targeted high schools are retained at rates 13.8 percent less than those from non-targeted high schools. There are 150 Asians who went to non-targeted high schools, and they are retained at a rate of 88 percent, but of the 7 who went to targeted high schools, only 2 are retained. Students at targeted schools have less access to advanced courses and have not experienced high levels of academic competition. Targeted high schools tend to be inner city or poor rural high schools, and are often predominantly minority students. These students appear to experience more challenges with both social and academic integration, despite having successful high school careers.

When looking at the academic variables, the only group for whom high school percentile is significant in the logistic regressions for retention is Hispanic students. However, even though it is significant, it contributes little to the likelihood of retention.

The academic variables that reflect an increase in retention as the value of the variable increases are quartile of high school rank for African Americans and Hispanics and quarter in high school class for African Americans, Hispanics, and Anglos, disregarding the 100 percent retention rate for the 8 students in the bottom quarter. Retention rates for African Americans, Hispanics and Anglos are highest for those in the top quarter of their high school class. One unexpected result was that the top quarter of Asian students had lower retention than the second quarter. However, upon further analysis by the author it has been determined that 23 percent of those students with top quarter rankings had parents who did not attend college compared with only 6.4 percent of those in the second quarter. There was little difference in the mean SAT, the gender mix, or the percentage from targeted high schools that explains this result for Asian students.

SAT scores are significant in the regression only for Hispanic students, but the effect is nonexistent. The retention rate for Hispanic students increases respectively for the first, second, and third quartile, but drops for the fourth quartile. The ethnic groups for whom those in the fourth quartile of SAT scores have the highest retention rate for their ethnic group are African

Americans and Asians. Even for these two groups, there is not a progression from lowest quartile to highest quartile with a concurrent increase in retention.

Grouping test scores by quartile does little to illuminate patterns in retention across ethnicities. One reason may be related to the distribution of test scores within ethnicities. Upon further review it has been found that for the African American and Hispanic students, 45 percent of each group have test scores that place them in the first quartile.

High levels of leadership points are associated with higher retention rates for Hispanics, Native Americans, and Anglos, and low leadership points are associated with the lowest retention rates for Hispanic, Asian, and Anglo students, but there is no match between leadership points and retention for African Americans. For Anglo students, retention increases with each increase in the quartile of leadership points. The same is true for Hispanic students except that retention rates for the second and third quartiles of leadership points are reversed. For all ethnic groups except for Asian students and students who did not report ethnicity, the highest retention rates were for students in the highest quartile of leadership points. As was suggested in the discussion of gender and leadership, giving more weight to the students with top levels of leadership activities during the admission process might help increase university retention rates.

High levels of service points are associated with higher retention rates for only African Americans. Including points for service in the admission

process appears to do little to help select students either for demographic representation or for the goal of increasing retention.

For all ethnicities except Anglos, retention rates are higher for students who lived on campus compared to those who lived off campus. African American students who lived on campus are retained at a rate that was almost ten percent higher than those off campus, and the rate for Hispanic students on campus is 5 percent higher. The retention rates for Anglo students who lived on and off campus are almost identical. With a greater representation of parents who completed college, Anglo students who live off campus may have resources available to cover the cost of the expensive commercial residence halls adjacent to campus that provide on-campus type experiences. Minority students who live off campus may be less likely to access housing that contributes to them becoming socially and academically integrated into the university experience.

In the evaluation of retention rates sorted by college, there are more subgroups with small numbers when ethnic groups are broken out, so drawing conclusions is difficult. Across ethnicity, the two colleges that tend to have the highest retention rates were Agriculture and Architecture. Engineering and Science tend to have lower rates. The retention rate for African Americans in Engineering was 60.9 percent. The lowest retention rate for Hispanics is the 62.5 percent for a small group of Education majors followed by General Studies majors and Engineering. For Asians, the

amazingly high 90.6 percent retention rate for students in Engineering is only exceeded by 100 percent retention of a small group in Agriculture. The lowest rate for Asians is the 66.7 percent for a small group of Science majors. Upon further evaluation by this author, it has been found that the five colleges with lower retention rates were home to 37.4 percent of Anglo, 46.3 percent of African American, 51.1 percent of Hispanic, and 42.1 percent of Asians students. Again, it appears that choice of major may play a role in the retention rates for various subgroups of students.

#### *Parents' Education Level*

In general, students whose parents have less education are less likely to be retained. Parents' education level is significant in the logistic regressions for retention for all students, for males and females, for the ethnic groups of Anglos, Hispanics and Asians, and for students from targeted high schools. It is the only variable that contributed significantly for Asian students and for students from targeted high schools, and the amount of variance explained for these two groups was the highest for any of the regressions. Students whose parents have the lowest levels of education can benefit from additional academic and social support while moving into the new environment. Students whose parents have less education are also more likely to come from less affluent households. These students may need additional sources of financial support while in college.

The lowest retention rates are for students whose parents did not go to high school. The rate for those whose parent's educational level was unknown is second lowest. Retention rates generally increase for each increment of parents' education level but drop off slightly for those whose parents had graduate degrees as compared to the retention for those whose parents had undergraduate degrees. The third highest subgroup, with 87% retention, surprisingly is students whose parents only had some high school. This group of 55 includes four Black females who were all retained, six Hispanic females who are all retained, seven Anglo females of whom six are retained, and fourteen Anglo males who are all retained. With further review, it was found that within this group, 39 students are in the top quarter of their high school class, and 46 are in the top third. Only one is in the third quarter of the high school class.

Males have higher retention than females if their parents either did not finish high school or had unknown education levels. Of the females in this group, 49.5 percent are Black, Hispanic and Asian, compared to 37.9 percent of the males. If their parents at least graduated from high school, females have higher retention than males. Some females who are the first in their family to attend college may find mixed emotional support from the family as they move toward personal independence. Female students often rely more on personal connections when they arrive in the new environment, but they

must develop new ways to relate to the large majority of students and faculty who are from very different backgrounds than their own.

At all levels of parents' education, students from targeted high schools are retained at a lower rate than those from non-targeted schools. The lowest retention rate is 38.5 percent for the 13 students from targeted schools whose parents had no high school, which reflects a difference of almost 33 percent when compared to the 71.4 percent retention rate for students from non-targeted schools whose parents had no high school. When parent's education level is condensed into two groups for those who did or did not attend college, there is a difference of 16.4 percent in the two retention rates for students from targeted high schools. This is the largest difference across all of the independent variables when comparing the two levels of parent's education. The 55.4 percent retention rate for students from targeted high schools whose parents did not attend college is also the lowest retention rate across the independent variables for students who reported their parent's education level. The combination of these two variables identifies the group of students most in need for additional academic and social support during the freshman year.

Across each quartile of high school percentile rank, across each quarter of high school class, and across each quartile of SAT scores, students have the lowest retention rates if their parents' education level was not reported. Those whose parents did go to college are retained in each

quartile of high school rank and each quartile of SAT scores at rates that are higher than those whose parents did not go to college. The same pattern is present for high school quarter except for the eight students in the bottom quarter who are all retained regardless of parent's education level.

Retention rates do not concurrently increase with each increase in the high school quartile and SAT score quartile within the groupings of parent's education. However, at 14.3 percent, the difference between the retention rates of students in the bottom SAT quartile whose parents did and did not attend college reflects the second largest difference among the independent variables. Their retention rate of 69.1 percent is the third lowest retention rate across all of the independent variables for students who reported their parent's education level.

Retention rates do increase concurrently with each quarter of high school class for both groups of students whose parents did or did not go to college, disregarding the 8 students in the bottom quarter of their high school class. The differences between the two groups when the students are in the third or second quarter of their class are more than 13 percent. The retention rate for those in the third quarter is just 63.6 percent making it the second lowest retention rate across the independent variables for students who reported their parent's education level.

For students who did not report parents' education level, retention rates are less than 70 percent for all pre-admission independent variables



except for the top two quartiles of SAT scores and the bottom quartile of leadership points. For students whose parents did not go to college, all retention rates are less than 80 percent except for the middle two quartiles of SAT scores, the top quartile of high school rank, and the 8 students in the bottom quarter of their class. The lowest retention rate for any subgroup of students whose parents went to college is 77.4 percent for students in the third quarter of their high school class. All of the pre-admission academic variables reflect differences in retention between the subgroups sorted by parent's education level, but combinations including lower levels of parent education and lower rank in class generate the highest levels of attrition, closely followed by lower levels of parent education and SAT scores.

Across each quartile of leadership points, retention levels increase from those who do not report parents' education level to those whose parents had no college to those whose parents attended college. Within the groups of students whose parents did and did not go to college, there is an increase in retention for each increase in quartile of leadership points.

The difference in the lowest and highest retention rates driven by quartile of leadership points is much smaller than the differences in the lowest and highest retention rates driven by parents' education level. Retention rates for every quartile of leadership points for students whose parents did not attend college are lower than retention rates for the lowest retention rate for students whose parents attended college. The same pattern is present when

comparing the retention rates for those students who did not report parent's education level when comparing them to those whose parents did not attend college. Therefore, a strategy to select students whose parents did not attend college who have the highest leadership points will not result in retention that is higher than for students whose parents attended college who have the lowest leadership points.

In regards to service points, the only pattern that relates to retention is that the retention rates for each level of the n-tiles are lowest for those students who did not report parents' education level. Retention rates are the highest for students whose parents went to college. Again, retention for the highest n-tile of service point for students whose parents did not attend college was lower than the lowest retention rate for students whose parents attended college.

For students whose parents went to college, retention rates are almost identical for those who lived on and off campus. Students who did not report their parents' education who lived off campus are retained at higher rates than the same parent subgroup who lived on campus. For students whose parents did not go to college, those who lived on campus are retained at a rate that is over 6 percent above that of the same parent subgroup of students who lived off campus. The optimal residential environment to maximize retention for students whose parents did not go to college is on campus.

Retention rates are higher in all of the colleges for students whose parents had some college except for Architecture where the subgroup had small numbers. Retention rates drop for each college for students whose parents had no college experience, and except for the Colleges of Agriculture and Architecture, the lowest retention rates are for students who did not report their parents' education level. For students who reported their parents' education level, the lowest retention rates are for those in the Colleges of Engineering, Geosciences, and Science and the highest retention rates are for those in the Colleges of Agriculture and Architecture.

Parents' education level consistently has a strong effect across the other independent variables. When lower levels of parents' education level are combined with attendance at a targeted high school, low rank in class, or low SAT score quartiles some of the lowest retention rates appear. The addition of leadership points cannot fully compensate for the differences in retention rates across the parent subgroups. High school rank quartiles and SAT quartiles also cannot fully compensate for parent's education level.

#### *Type of High School*

Students from targeted high schools are less likely to be retained than students from high schools that are not targeted. This is true for both genders and for all ethnicities except for a very small group of students whose ethnicity was unknown. It is true for all levels of parent's education, even for parents who had college degrees. It is true for high school rank, SAT scores,

leadership points, points for service, and for on or off-campus residence. It is true for every college except Architecture. In Architecture all five students who are from targeted high schools are retained, so their retention rate was higher than their peers from non-targeted high schools. The only variable that is significant for students from targeted school is parents' education level. It increased the likelihood of retention more than for all other groups except for Asian students, and it accounted for one of the two highest amounts of variance, although it was less than ten percent. Increasing the participation of students from less affluent high schools can increase the diversity of the freshman class. However, students from targeted schools appear to need additional support during the first year at this institution.

### Research Recommendations

Further analysis of retention for freshmen should be conducted utilizing at least 5 years of data so that numbers in the ethnic or non-traditional student subpopulations will be sufficient to generate more useful data. Other independent variables such as household income level, math and verbal SAT scores, the number of advanced classes taken in high school, and highest level of math completed in high school could provide useful information if included in a similar analysis.

The categories of targeted and non-targeted high schools should be expanded to reflect rankings of high schools assigned by the Texas

Education Agency. This would increase the number of high schools identified as weaker high schools, and identify more students who may have received less preparation for college because of lack of access to advanced courses in high school and less rigorous levels of competition compared to their peers at non-targeted schools.

### Recommendations for the Field

There are increasing national political pressures to eliminate the use of ethnicity in college admission processes. Without the ability to include ethnicity in the selection process, selective universities must identify other mechanisms to recruit and retain a freshman class that is demographically representative of the high school graduates of the state. One such option is to recruit first-generation students and students from high schools in disadvantaged areas. More research should be conducted to identify the most efficient and effective support services that will help these students be retained at levels comparable to the student body.

At Texas A&M University, the President recently announced an initiative to increase demographic representation through recruitment of and scholarships for first-generation students from households with low incomes. Unless additional academic and social support services are provided in a way that enhances retention through the second year, many of these students will have a revolving-door experience.

Each variable in the admission review process should be periodically evaluated for its effectiveness in capturing a freshman class that is demographically more representative of the state and capturing the students who can be retained at higher rates at Texas A&M University. From this study, the category for service activities seems to be particularly ineffective at contributing to either goal.

There needs to be an increase in communication about the process that begins with admission and results in retention. Parallel to a review of admission criteria, a university-wide assessment of retention should be conducted, and a retention plan should be produced, implemented, and periodically updated. The plan should include an assessment of best practices on campus and at other universities, identify additional mechanisms to identify unmet needs of students who appear less likely to be retained, propose additional support systems and programs that can be implemented to increase retention rates, set a broad timeline for implementation and it should support the development of systems to assess the outcomes. A system based upon continuous assessment that included participants from both admissions and from advising could identify profiles of students who are at risk of academic difficulties in some majors and increase communication about successful mechanisms for academic support.

For example, students in the population in this study who did not report parents' education level and students whose parents did not attend college

were retained to their second fall at the university at a much lower rate than those whose parents did attend college. Their transition to the new environment spanned a wider gap. These students, particularly those in the bottom quartiles of rank, scores, and leadership points, need to be encouraged or required to participate in programs that will enhance the opportunity for social and academic integration into the university.

Students in this population who attended targeted high schools were retained to the second fall at the university at a lower rate than those who attended non-targeted high schools. Even though they had a demonstrated track record that reflected a conscientious attitude toward academics, they may not have been able to access advanced courses in high school and they may have experienced a less robust level of academic competition. The university should identify mechanisms to more accurately assess each student's skills and place them in the most appropriate first-semester classes. These students should be encouraged to participate in programs that ease the transition into the university experience. Students from targeted high schools whose parents did not attend college should be required to participate in support programs.

Students in this study who enrolled in science and engineering majors were retained to the second fall at the university at lower rates than those who enrolled in other majors. Profiles of students who succeed and students who fail in those majors should be identified to determine whether or not

remediation or support programs can bridge the gap for weaker students or students in higher risk groups.

There was almost a ten percent drop in retention for students who were in the third quarter of their high school class as compared to those who were in the second quarter. If students in the bottom half of their class were ranked lower because they were enrolled at the most competitive and/or private high schools, higher retention rates might be expected rather than lower rates. If these students are admitted, they should be included in the pool of students encouraged or required to participate in programs that ease the transition into the university experience.

Mechanisms should be identified for increasing communication with parents of students in higher risk groups during the months prior to the first fall of enrollment and during the freshman year. The importance of participating in a freshman support program and living on campus should be clearly conveyed to both the parents and students. Since enrollment of first-generation Hispanic students is likely to increase, students whose parents have limited English skills should be identified, and information should be provided in both English and Spanish to these families.

All of these issues reflect a need for increasing communication and collaboration between those involved in admission and those involved in retention of freshmen. There are multiple levels of costs when students fail. There are financial and emotional costs that the student bears. When



students fail, it makes it more difficult for the university to recruit other siblings and friends. It also makes it less likely that the university will meet goals it has put forth in the public forum. A direct cost to the state is the lost investment of financial aid, and the additional investment required for degree completion. Ultimately, the loss of a student can mean the loss of highly educated professionals in the workforce who contribute to a thriving state economy.

#### Closing

The purpose of this study was to analyze the relationships between and among pre-admission demographic variables, pre-admission academic variables, pre-admission non-academic variables, and post-admission variables and retention of freshmen to the second fall of their college experience at Texas A&M University. In doing so, it was hoped that it would help the university determine or improve mechanisms that contribute to the selection of students who can succeed at the university.

Each university provides elements of the college experience that are universal, but every university provides elements that are unique to the institution and to the students who enroll. Students are absorbing a greater percentage of the cost of higher education. Their expectations and their parents' expectations for positive outcomes are increasing.

Even though the percentage of funding for university budgets that comes from state appropriations has declined, the political climate has focused attention on representative access to higher education, representative participation and completion of college degrees for all ethnicities, assessment of outcomes and accountability. Flagship institutions are in a leadership position, but are overcoming a history of providing environments for freshmen that have been less supportive during the process of social and academic integration into the community of scholars. During the last ten years, much has been accomplished to improve the experience for freshmen, but there is much that still can be accomplished.

## REFERENCES

- American Council on Education (2002). Facts in brief: Disparities continue for women and minorities in degree completions, NCES data show. *Higher Education and National Affairs*, 51(1). Retrieved on March 1, 2002) from [http://www.acenet.edu/hena/facts\\_in\\_brief/2002/01\\_14\\_02\\_fib.cfm](http://www.acenet.edu/hena/facts_in_brief/2002/01_14_02_fib.cfm).
- Anaya, G., & Cole, D. (2001). Latina/o student achievement: Exploring the influence of student-faculty interactions on college grades, *Journal of College Student Development*, 42(1), 3-14.
- Anderson, B., Creamer, D., & Cross, L. (1989). Undecided, multiple change, and decided students: How different are they? *National Academic Advising Association Journal*, 9(1), 46-50.
- Arbona, C., & Novy, D. (1990). Non-cognitive dimensions as predictors of college success among Black, Mexican-American, and White students, *Journal of College Student Development*, 31, 415-422.
- Astin, A. (1973). The impact of dormitory living on students, *Educational Record*, 54, 204-210.
- Astin, A. (1975). *Preventing students from dropping out*. San Francisco: Jossey-Bass.
- Astin, A. (1977). *Four critical years: effects of college on beliefs, attitudes, and knowledge*. San Francisco: Jossey-Bass.
- Astin, A. (1984). Student involvement: A developmental theory for higher education, *Journal of College Student Personnel*, 25, 297-308.
- Astin, A. (1985) *Achieving academic excellence*. San Francisco: Jossey-Bass.
- Baker, R, McNeil, O., & Siryk, B. (1985). Expectation and reality in freshman adjustment to college. *Journal of Counseling Psychology*, 32(1), 94-103.
- Barker, R., & Associates (1978). *Habitats, environments, and human behavior*. San Francisco: Jossey-Bass.
- Barnes, M. (1922). College entrance examinations. Edited: *The Twenty-second Annual Report of the Secretary, College Entrance Examination Board*. New York: The Board.

Battle, J. (1982). *Enhancing self esteem and achievement: A handbook for professionals*. Seattle: Special Child Publications.

Bean, J. (1980). Dropouts and turnover: The synthesis and test of a causal model of student attrition. *Research in Higher Education*, 12, 155-187.

Bean, J., & Bradley, R. (1986). Untangling the satisfaction-performance relationship for college students. *Journal of Higher Education*, 57(4), 393-412.

Bean, J., & Metzner, B. (1985). A conceptual model of nontraditional undergraduate student attrition. *Review of Educational Research*, 55 (4) 485-540.

Beil, C., Reisen, C., Zea, M., & R. Caplan (1999). A longitudinal study of the effects of academic and social integration and commitment on retention, *NASPA Journal*, 37(1), 376-385.

Bell-Rose, S. (1999). What it takes: a look at black achievers, *The College Board Review*, 187, 8-18.

Benson, L. (1991). *A youth leadership training case study*. Unpublished Ph.D. Dissertation, University of Alberta, Edmonton.

Bliming, G. (1989). A meta-analysis of the influence of college residence halls and academic performance, *Journal of College Student Development*, 30, 298-308.

Bok, D. (1986). *Higher learning*. Cambridge, MA: Harvard University Press.

Boli, J., Katchadourian, H., & Mahoney, S. (1988). Analyzing academic records for informed administration, *Journal of Higher Education*, 59(1), 54-68.

Bowen, W., & Bok, D. (1998). *The shape of the river*. Princeton, NJ: Princeton University Press.

Bowman, S., & York-Anderson, D. (1991). Assessing the college knowledge of first-generation and second-generation college students. *Journal of College Student Development*, 32(2), 116-122.

Boyd, K. (1999). An analysis of characteristics of students who have experienced academic difficulties at Texas A&M University: Are there gender

differences?, Unpublished manuscript. College Station, TX: Texas A&M University

Braxton, J. (1993). Selectivity and rigor in research universities, *Journal of Higher Education*, 64(6), 657-675.

Braxton, J., Brier, E., & Hossler, D. (1998). The influence of student problems on student withdrawal decisions: An autopsy on "autopsy" studies, *Research in Higher Education*, 28 (3) 257-268.

Braxton, J., Olsen, D., & Simmons, A. (1998). Affinity disciplines and the use of principles of good practice for undergraduate education, *Research in Higher Education*, 39(3), 299-318.

Braxton, J., Sullivan, A., & Johnson, R., Jr. (1997). Appraising Tinto's theory of college student departure. In J. Smart (Ed.). *Higher Education: Handbook of Theory and Research* (Vol. 12, p. 107-164). New York: Agathon.

Bringle, R., & Hatcher, J. (1996). Implementing service learning in higher education, *Journal of Higher Education*, 67(2), 221-239.

Brungardt, C., & Crawford, C. (1996). A comprehensive approach to assessing leadership students and programs: Preliminary findings, *The Journal of Leadership Studies*, 3(1), 37-48

Cabrera, A., Casteneda, M., & Nora, A. (1993). College persistence: Structural equations modeling test of an integrated model of student retention, *Journal of Higher Education*, 64(2), 123-139.

Cabrera, A., Casteneda, M., Nora, A., & Hengstler, D. (1992). The convergence between two theories of college persistence, *Journal of Higher Education*, 63 (2), 143-164.

Camara, W. (February 5, 1998). Testimony before the California State Senate Select Subcommittee on Higher Education Admissions and Outreach. ERIC Reproduction Service, Document No. ED 448672.

Camara, W., and Schmidt (1999). Group Differences in Standardized Testing and Social Stratification (College Board Report 99-5). New York: College Entrance Examination Board.

Campbell, V. Lopez, F., & Watkins, C., Jr., (1988). Family structure, psychological separation, and college adjustment: A canonical analysis and cross-validation, *Journal of Counseling Psychology*, 35, 402-409.

Center for Statistical Computing Support , University of Kentucky (December 1, 2003). Multicollinearity in Logistic Regression, *Social Sciences Teaching and Research Statistics*. Retrieved on December 1, 2003 at <http://www.uky.edu/ComputingCenter/SSTARS/MulticollinearityinLogisticRegression.htm>.

Chapman, D. ( 1998). Testimony before the California State Senate Select Subcommittee on Higher Education Admissions and Outreach, February 15, 1998. ERIC Reproduction Service, Document No. ED 448672.

Chickering, A. (1974). *Commuting versus resident students*. San Francisco: Jossey-Bass.

Colbeck, C., Campbell, S., Bjorklund, S. (2000). Grouping in the dark: What college students learn from group projects, *Journal of Higher Education*, 71(1), 60-85.

College Entrance Examination (1925). *The Twenty-fifth Annual Report of the Secretary*. New York: The Board.

College Entrance Examination (1928). *The Twenty-eighth Annual Report of the Secretary*. New York: The Board.

Crawford, C. (1966). Family attachment, family support for migration, and migration plans of young people. *Rural Sociology*, 31, 293-300.

Donavan, R. (1984). Path analysis of a theoretical model of persistence in higher education among low-income black youth, *Research in Higher Education*, 21, 243-255.

Dowling, G. (2000a). State of Texas student flow model. College Station: The Texas A&M University System, Office of the Vice Chancellor for Academic and Student Affairs.

Dowling, G. (2000b). Statewide university student migration report, first time, full-time undergraduates, fall 1998 to fall 1999. College Station, TX: The Texas A&M University System, Office of the Vice Chancellor for Academic and Student Affairs.

Droleskey, S. (2000). *Influence of Texas Higher Education Performance Measures on Planning in Texas Public Institutions of Higher Education: A Comparative Analysis*, Unpublished Ph.D. dissertation, College Station: Texas A&M University.

Eaton, S. & Bean, J. (1995). An approach/avoidance behavioral model of college student attrition. *Research in Higher Education*, 36(6), 617-645.

Elliott, R. & Strenta, A. (1988). Effects of improving the reliability of the GPA on prediction generally and on comparative predictions for gender and race particularly, *Journal of Educational Measurement*, 25, 333-347.

Ferguson, J., Wisner, R., & Discenza, R. (1986). Developing a framework for student retention: A challenge to traditional enrollment approaches, *NASPA Journal*, 24(2), 2-9.

Fleming, J. , & Garcia, N. (1998). Are standardized tests fair to African Americans? Predictive validity of the SAT in black and white institutions, *Journal of Higher Education*, 69(5), 471-495.

Flowers, L., & Pascarella, E. (1999). Cognitive effects of college racial composition on African American students after 3 years of college, *Journal of College Student Development*, 40(6), 669-677.

Fuertes, J., & Sedlacek, W. (1995). Using non-cognitive variables to predict the grades and retention of Hispanic students, *College Student Affairs Journal*, 14(2), 30-36.

Gardner, J. (1996). Reflections on the first-year residential experience. In W. Zeller, D. Fidler and B. Barefoot (Eds.), *Residence Life Programs and the First-Year Experience*, 1-10. National Resource Center for The Freshman Year Experience & Students in Transition. Columbia: University of South Carolina.

Garson, G. (2002, November 1). *Logistic Regression*. [Online]. Available at: <http://www2chass.ncsu.edu/garson/pa765/logistic.htm>.

George, D., & Mallery, P. (2003). *SPSS for Windows Step by Step*. Boston, Pearson Education, Inc

Gloria, A. & Hird, J. (1999). The Influences of ethnic and nonethnic variables on the career decision-making self-efficacy of college students. *The Career Development Quarterly*, 48(2), 157-174.

Goldman, R., & Hewitt, B. (1976). Predicting the success of black, chicano, oriental, and white college students. *Journal of Educational Measurement*, 13, 107-117.

Grayson, J. (1997). Academic achievement of first-generation students in a Canadian university, *Research in Higher Education*, 38(6), 659-676.

Gregoire, J. (1994). The effects of leadership social skill training in mixed-gender cooperative groups on science achievement, attitudes toward science, classroom climate and verbal interaction. Unpublished dissertation: Minneapolis, MN: University of Minnesota.

Healy, C. (1991). Exploring a path linking anxiety, career maturity, grade point average, and life satisfaction in a community college population. *Journal of College Student Development*, 32, 207-211.

Herrnstein, R., & Murray, C. (1994). *The bell curve: Intelligence and class structure in American life*. New York: Free Press.

Hinkle, D., Wiersma W., & S. Jurs (1988). *Applied Statistics for the Behavioral Sciences*. Boston, Houghton Mifflin Company.

Holland, J. (1959). The prediction of college grades from the California Psychological Inventory and the Scholastic Aptitude Test, *Journal of Educational Psychology*, 50(4), 135-142.

Holland, J. (1960). The prediction of college grades from personality and aptitude variables, *Journal of Educational Psychology*, 51(5), 245-254.

Holland, J. (1964). Prediction of academic and extracurricular achievement in college, *Journal of Educational Psychology*, 55(1), 55-65.

Holland, J. (1985). *Making vocational choices: A theory of vocational personalities and work environments*. Englewood Cliffs, New Jersey: Prentice-Hall.

Hopwood v. State of Texas, 78 F. 3d 932 (5<sup>th</sup> Cir. 1996).

Hurtado, S. (1994). Latino student transition to college: Assessing difficulties and factors in successful college adjustment, Paper presented at the 1994 Forum of the Association for Institutional Research, Eric Document Reproduction Service, Document No. ED 373663.

Hurtado, S., Carter, D., & Spuler, A. (1996). Latino student transition to college: Assessing difficulties and factors in successful college adjustment, *Research in Higher Education* 37(2), 135-157.



Jencks, C. (1998). Racial bias in testing. In C. Jencks and M. Phillips (Eds.), *The Black-White Test Score Gap*. Washington, D.C.: Brookings Institution Press.

Jencks, C. & Phillips, M., Eds. (1988). *The black-white test score gap*. Washington, D.C.: Brookings Institution Press.

Kanoy, K., and Bruhn, J. (1996). Effects of a first-year living and learning residence hall on retention and academic performance. *Journal of the Freshman Year Experience & Students in Transition*, 8, 7-23.

Kouzes, J. & B. Posner (1987). *The leadership challenge*. San Francisco: Jossey-Bass.

Kozol, J. (1991). *Savage inequalities*. New York: Crown Publishers, Inc.

Kraft, C. (1991). What makes a successful Black student on a predominantly White campus?, *American Educational Research Journal* 28(2), 423-443.

Kramer, G., Higley, H., & Olsen, D. (1994). Changes in academic major among undergraduate students, *College and University*, 70, 88-98.

Lapsley, D., Rice, K., & Shadid, G. (1989). Psychological separation and adjustment to college, *Journal of Counseling Psychology*, 36(3), 286-294.

Larose, S., Robertson, D., Roy, R., & Legault, F. (1998). Nonintellectual learning factors as determinants for success in college, *Research in Higher Education*, 39(3), 275-97.

Lent, R., Brown, S., & Hackett, G. (1996). Career development from a social, cognitive perspective. In D. Brown & L. Brooks (Eds.), *Career choice and development* (pp. 373-422). San Francisco: Jossey Bass.

Levine, A., (1989). Learning by doing: Through public service, *Change*, 21(5), 18-21, 24-26.

Linn, R., & Harnisch, D. (1981). Interactions between item context and group membership on achievement test items, *Journal of Educational Measurement*, 18, 109-118.

London, H. (1989). Breaking away: A study of first-generation college students and their families, *American Journal of Education*, 97(2), 144-170.

Luzzo, D. (1993). Value of career decision-making self-efficacy in predicting career decision-making attitudes and skills. *Journal of College Student Development*, 36, 61-66.

Markus, G., Howard, J., & King, D. (1993). Integrating community service and classroom instruction enhances learning: Results from an experiment, *Educational Evaluation and Policy Analysis*, 15(4), 410-419.

McGrath, M., & Braunstein, A. (1997). The prediction of freshmen attrition: An examination of the importance of certain demographic, academic, financial, and social factors, *College Student Journal*, 31, 396-408.

McKean, K. (1994). Academic helplessness: applying learned helplessness theory to undergraduates who give up when faced with academic setbacks, *College Student Journal*, 28, 456-462.

Menard, S. (2002). *Applied logistic regression analysis*. Thousand Oaks, CA: Sage Publications.

Mortenson, T. (1995). Private economic benefits and costs of baccalaureate education, 1975 to 1995, *Postsecondary Education Opportunity – The Mortensen Research Letter on Public Policy Analysis of Opportunity for Postsecondary Education*, 37, 8-12.

Murdock, S., Pecotte, B., McGehee, M., Pope, P., & Bailey, R. (1998). *An assessment of potential needs unmet and opportunities lost as a result of Hopwood*. Paper presented at the Second Annual conference on Minorities and Policy Issues, College Station, TX: George Bush Presidential Library Conference Center.

Murguia, E., Padilla, R. & Pavel, M. (1991). Ethnicity and the concept of social integration in Tinto's model of institutional departure, *Journal of College Student Development*, 32(5), 433-439.

Mutter, P. (1992). Tinto's theory of departure and community college student persistence, *Journal of College Student Development*, 33, 310-317.

Nagda, B., Gregerman, S., Jonides, J., von Hippel, W., & Lerner, J. (1998). Undergraduate student-faculty research partnerships affect student retention, *The Review of Higher Education*, 22(1), 55-72.

National Center for Education Statistics (2001a). Projections of Education Statistics to 2011. Retrieved on July 15 2002 from <http://nces.ed.gov/pubs2001/proj01/chapter2.asp>.

National Center for Education Statistics (2001b). Digest of Education Statistics. [Online]. Retrieved on July 15, 2002 from <http://nces.ed.gov/pubs2002/digest2001/ch3.asp>.

National Center for Education Statistics (2002). Profile of Undergraduates in U.S. Postsecondary Educational Institutions: 1999-2000. Washington, D.C.: U.S. Department of Education.

Nisbett, R. (1998). "Race, Genetics, and I.Q.," In C. Jencks and M. Phillips (Ed.), *The Black-White Test Score Gap*. Washington, D. C.: Brookings Institution Press.

Noel L., Levitz R. , Saluri, D. & Associates (1985). *Increasing student retention*. San Francisco: Jossey-Bass.

Northouse, P. (1997). *Leadership: Theory and practice*. Thousand Oaks, California: Sage Publications.

Office of Admissions and Records, Texas A&M University (1997). *New freshman retention as of 12<sup>th</sup> class day, fall 1986-1997*. (Working paper). College Station: Texas A&M University.

Office of Admissions and Records (1998). Targeted Recruited High Schools 1998-1999. (Working paper). College Station, TX: Texas A&M University.

Office of Admissions and Records (1999). 1999-2000 Developing & Recruited High Schools. (Working paper). College Station, TX: Texas A&M University.

Office of Admissions and Records (2001a). Applicant review status form. (Working paper). College Station, TX: Texas A&M University.

Office of Admissions and Records(2001b) Process of selection for 2001-2002 targeted and recruited high schools. (Working paper). College Station, TX: Texas A&M University.

Office of the Governor of the State of Texas (1981). *Texas equal educational opportunity plan for higher education*. Austin, TX.

Office of Institutional Studies and Planning, Texas A&M University (2001). Texas A&M University retention and graduation report, fall 1994-fall 2000. College Station.

Office of the Texas Comptroller of Public Accounts (1999). *Disparity in Texas higher education*, Publication # 96-607, Austin, TX.

Orfield, G. (1989). Hispanics, In A. Levine (ed.) *Shaping Higher Education's Future*, San Francisco: Jossey Bass Publishers.

Pantages, T. & Creedon, C. (1987). Studies of college attrition: 1950-1975, *Review of Educational Research*, 48(1), 49-101.

Pascarella, E. (1985). The influence of on-campus living versus commuting to college on intellectual and interpersonal self-concept, *Journal of College Student Personnel*, 26, 292-299.

Pascarella, E., & D. Chapman (1983). A multi-institutional path analytic validation of Tinto's model of college withdrawal. *American Educational Research Journal*, 20,(1), 87-102.

Pascarella, E., Edison, M., Hagedorn, L., Nora, A., & Terenzini, P. (1996). Influences on students' internal locus of attribution for academic success in the first year of college, *Research in Higher Education*, 37(6), 731-754.

Pascarella, E., Smart, J., & Ethington, C. (1986). Long-term persistence of two-year college students. *Research in Higher Education*, 24 (1), 47-71.

Pascarella, E., & Terenzini, P. (1980). Student-faculty and student-peer relationships as mediators of the structural effects of undergraduate residence arrangement, *Journal of Educational Research*, 73, 344-353.

Pascarella, E., & Terenzini, P. (1981). Residence arrangement, student/faculty relationships, and freshman-year educational outcomes, *Journal of College Student Personnel*, 22, 147-155.

Pascarella, E., & Terenzini, P.(1991). *How college affects students*. San Francisco: Jossey Bass.

Pennock-Roman, M. (1990). *Test validity and language background: A study of Hispanic American students at six universities*. New York: College Entrance Examination Board.

Peterson, S. (1993). Career decision-making self-efficacy and institutional integration of underprepared college students. *Research in Higher Education*, 34,(6), 659-695.

Phillips, M., Brooks-Gunn, J. Duncan, G., Klebanov, P. & Crane, J. (1998) "Family background, parenting practices, and the black-white test score gap." In C. Jencks and M. Phillips (Ed.), *The Black-White Test Score Gap*. Washington, D. C.: Brookings Institution Press.

Phillips, M., Crouse, J., & Ralph, J. (1998) "Does the Black-White test score gap widen after children enter school?" In C. Jencks and M. Phillips (Ed.), *The Black-White Test Score Gap*. Washington, D.C.: Brookings Institution Press.

Pike, G. (1991). The effects of background, coursework, and involvement on students' grades and satisfaction, *Research in Higher Education*, 32(1), 15-30.

Pounds, A. (1989). "Black Students." In M. Upcraft and J. Gardner (Ed.), *The Freshman Year Experience*. San Francisco: Jossey Bass Publishing.

Rhoads, R. (1997). *Community service and higher learning*. Albany, NY: State University of New York Press.

Rhoads, R., & Neururer, J. (1998). Alternative spring break: Learning through community service. *NASPA Journal*, 35(2), 100-118.

Rice, K. (1992). Separation-individuation and adjustment to college: A longitudinal study, *Journal of Counseling Psychology*, 39, 203-213.

Richards, J., Holand, J., & Lutz S. (1966). The prediction of student accomplishment in college, *ACT Research Reports*, 18.

Riehl, R. (1994). The academic preparation, aspirations, and first-year performance of first-generation students. *College and University*, 70, 14-19.

Roberts, J. (1997). The impact of leadership training on ninth grade students' academic achievement, disciplinary referrals, extracurricular activities, participation, and leadership skills. Unpublished dissertation: Gainesville, FL: University of Florida.

Rogers, B. (1984). The use of non-cognitive variables in the prediction of Black freshmen's academic performance. Paper presented at the annual meeting of the Southern Association of Institutional Research, Little Rock. Eric Reproduction Services, Document No. ED258498.

Rowser, J. (1994). Do African American and white students' perceived needs change after freshman year? *College Student Journal* 28(2), 230-234.

Royal Windsor Society of Nurse Research (2003). *Spearman Rank Order Coefficient*. Retrieved on August 27, 2003 at [www.kelcom.igs.net/~nhodgins/spearman\\_rank\\_resear\\_analysis.html](http://www.kelcom.igs.net/~nhodgins/spearman_rank_resear_analysis.html).

Schmitt, A. (1988). Language and cultural characteristics that explain differential item functioning for Hispanic examinees on the SAT, *Journal of Educational Measurement*, 25, 1-13.

Schmitt, A., & Dorans, N. (1990). Differential item functioning for minority examinees on the SAT, *Journal of Educational Measurement*, 27, 69-91.

Sedlacek, W. (1977). Test bias and the elimination of racism. *Journal of College Student Personnel*, 18, 16-20.

Sedlacek, W. (1999). Black students on White campuses: 20 years of research, *Journal of College Student Development* 40(5), 538-550.

Sedlacek, W., & Brooks, G. (1976). *Racism in American education: A model for change*, Chicago: Nelson Hall.

Sedlacek, W., & Webster, D. (1978). Admission and retention of minority students in large universities, *Journal of College Student Personnel*, 19, 242-248.

Seymour, E., & Hewitt, N. (1997). *Talking about leaving: why undergraduates leave the sciences*. Boulder, Colorado: Westview Press.

Simpson, W. (1987). Tracking students through majors, *Journal of Higher Education*, 58(3), 323-343.

Solomon, L., & Wingard, T. (1991). The Changing Demographics: Problems and Opportunities. In P. Altback and K. Lomotey (Eds.) *The Racial Crisis in American Higher Education* (pp19-42). Buffalo, NY: State University of New York Press.

Spady, W. (1970). Dropouts from higher education: An interdisciplinary review and synthesis, *Interchange*, 1, 64-85.

Spencer, S., Steele, C., & Quinn, D. (1997). Under suspicion of inability: Stereotype threat and women's math performance.

SPSS (2001). *SPSS Regression Models 11.0*. Chicago: SPSS, Inc.

- Steele, C. (1997). A threat in the air: How stereotypes shape intellectual identity and performance, *American Psychologist*, 52(6), 613-29.
- Steele, C., and Aronson, J. (1998). Stereotype threat and the test performance of academically successful African Americans. In C. Jencks and M. Phillips (Ed.) *The Black-White Test Score Gap*. Washington D.C.: Brookings Institution Press.
- Stephenson, M. (2001). The Impact of High School Curriculum and High School Campus Characteristics on Graduation Rates from Texas Four-year Public Institutions of Higher Education. Unpublished Ph.D. dissertation. College Station, TX: Texas A&M University.
- Stern, G. (1970). *People in context: Measuring person-environment congruence in education and industry*. New York: John Wiley & Sons.
- Strenta, A., & Elliott, R. (1987). Differential Grading Standards Revisited, *Journal of Educational Measurement*, 24, 281-291.
- Szafran, R. (2001). The effect of academic load on success for new college students: Is lighter better?, *Research in Higher Education*, 42(1), 27-50.
- Terenzini, P., Rendon, L, Upcraft, M., Millar, S., Allison, K., Gregg, P., & Jalomo, R. (1994). The transition to college: Diverse students, diverse stories, *Research in Higher Education*, 35(1), 5773.
- Texas A&M University (1981). A plan to increase the rates of participation of blacks and Hispanics in enrollments, degrees conferred and employment. Office of the President. College Station, TX.
- Texas A&M University (1999). *Texas A&M University 1999-2000 undergraduate catalogue*. Office of Admissions and Records. College Station, TX.
- Texas A&M University (2000). *Vision 2020: Creating a culture of excellence*. College Station, TX.
- Texas Education Agency (2002). *2001 District Accountability Rating History*. Retrieved on May 31, 2002, from [http://www.tea.state.tx.us/cgi/sas8/broker?\\_service=Alamo&\\_program=perf rept.perfmast.sas](http://www.tea.state.tx.us/cgi/sas8/broker?_service=Alamo&_program=perf rept.perfmast.sas) . . .
- Texas Higher Education Coordinating Board (2000). *Closing the Gaps*, 2000. Austin:

Texas Higher Education Coordinating Board (2002). *Texas Public Universities' Data and Performance Report*. Austin: Texas Higher Education Coordinating Board.

Thompson, Jane, Samiratedu, V., & Rafter, J. (1993). The effects of on-campus residence on first-time college students, *NASPA Journal*, 31(1), 41-47.

Ting, S. (1998). First-year grades and academic progress of college students of first-generation and low-income families, *Journal of College Admission*, 158 15-23.

Ting, S. (2000). Predicting Asian American's academic performance in the first year of college: an approach combining SAT scores and non-cognitive variables, *Journal of College Student Development*, 41(4), 442-449.

Ting, S., & Robinson, T. (1998). First-year academic success: A prediction combining cognitive and psychosocial variables for Caucasian and African American Students, *Journal of College Student Development*, 39(6), 599-610.

Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research*, 54, 89-125.

Tinto, V. (1987). *Leaving college: Rethinking the causes and cures of student attrition*. Chicago: University of Chicago Press.

Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition*. Chicago: University of Chicago Press.

Tinto, V. (1997) Classrooms as communities, *Journal of Higher Education*, 68(6), 598-623.

Tinto, V., & Love, A. (1995). A Longitudinal Study of Learning Communities at LaGuardia Community College, Report published by the National Center on Postsecondary Teaching, Learning, and Assessment, Eric Document Reproduction Services, Document No. ED 380178.

Tinto, V., Goodsell-Love, A., & Russo, P. (1993). Building Community, *Liberal Education*, 79(1) 1993, 16-21.

Tom, A (1982). Non-traditional predictors of academic success for special action admissions. Eric Reproduction Services, Document No. ED 256268.



Tracey, T., & Sedlacek, W. (1984). Non-cognitive Variables in Predicting Academic Success by Race, *Measurement and Evaluation in Guidance*, 16, 171-178.

Tracey, T., & Sedlacek, W. (1985). The relationship of non-cognitive variables to academic success: a longitudinal comparison by race, *Journal of College Student Personnel*, 26, 405-410.

Tracey, T., & Sedlacek, W. (1987a). Prediction of college graduation using non-cognitive variables by race, *Measurement and Evaluation in Counseling and Development*, 19(4), 177-184.

Tracey, T., & Sedlacek, W. (1987b). A comparison of white and black student academic success using non-cognitive variables: A LISREL analysis. *Research in Higher Education*, 27(4), 333-348.

White, T., & Sedlacek, W. (1986). Non-cognitive predictors, *The Journal of College Admissions*, 3, 20-23.

Whitehead, J. An Introduction to Logistic Regression. Retrieved on September 8, 2003 from [personal.ecu.edu/whiteheadj/data/logit/intro.htm](http://personal.ecu.edu/whiteheadj/data/logit/intro.htm).

Widaman, K. F. (February 5, 1998). Testimony before the California State Senate Select Subcommittee on Higher Educationa Admissions and Outreach. ERIC Reproduction Services, Document No. ED 448672.

Wiekowski, T. (1992). Student community service programs: The academic connection, *NASPA Journal*, 29(3), 207-212.

Williams, T., & Leonard, M. (1988). Graduating black undergrads: The step beyond retention, *Journal of College Student Development*, 29, 69-75.

Willner, E. (1982). Characteristics related to students withdrawing from college, *Community College Review*, 10, 59-64.

## APPENDIX A

## CONCORDANCE BETWEEN ACT COMPOSITE AND SAT I V+M Scores

ACT Composite	SAT I V+M	ACT Composite	SAT I V+M
36	1600	23	1070
35	1580	22	1030
34	1520	21	990
33	1470	20	950
32	1420	19	910
31	1380	18	870
30	1340	17	830
29	1300	16	780
28	1260	15	740
27	1220	14	680
26	1180	13	620
25	1140	12	560
24	1110	11	500

## APPENDIX B

## COLLAPSED VARIABLES

Quartiles of High School Rank	Range
First Quartile	13-68%
Second Quartile	69-79%
Third Quartile	80-85%
Fourth Quartile	86-99%
Quartiles of SAT Points	Range
First Quartile	740-1050
Second Quartile	1060-1110
Third Quartile	1120-1180
Fourth Quartile	1190-1540
Quartiles of Leadership Points	Range
First Quartile	0-0.5
Second Quartile	1-1.5
Third Quartile	2-2.5
Fourth Quartile	3-9
Ntiles of Service Points	Range
First Ntile	0-1.5
Second Ntile	2-2.5
Third Ntile	3-4

## APPENDIX C

## TABLES WITH SMALL N's IN CELLS

TABLE 13

One-year Retention Rates for Freshmen Sorted by Ethnicity and Pre-admission Cognitive Variables

High School Rank In Quartiles	Black	Hisp	N. Am.	As. Am.	Anglo	Not Rptd.
First Quartile	22	95	7	23	699	14
Second Quartile	41	93	9	57	942	15
Third Quartile	30	84	6	37	897	7
Fourth Quartile	26	74	5	34	861	17
Quarter of Rank In High School						
Bottom Quarter	---	1	---	---	7	---
Third Quarter	3	22	2	2	96	1
Second Quarter	37	126	10	47	1059	19
Top Quarter	81	281	18	108	2503	39
SAT Scores In Quartiles						
First Quartile	54	193	5	44	894	14
Second Quartile	27	95	6	33	903	11
Third Quartile	25	83	12	39	921	18
Fourth Quartile	15	59	7	41	947	16

TABLE 15

One-year Retention Rates for Freshmen Sorted by Ethnicity and Post-admission Variables

College	Black	Hisp	N. Am.	As. Am.	Anglo	Not Rptd.
Agriculture	5	22	1	8	363	4
Architecture	2	7	---	1	75	2
Business	15	48	6	22	492	7
Education	1	8	3	3	227	4
Engineering	23	84	5	32	484	9
Gen. Studies	42	125	8	57	1140	9
Geosciences	---	4	---	---	25	4
Liberal Arts	18	48	5	12	441	14
Science	6	40	2	9	175	4
Vet. Medicine	9	44	3	13	243	2

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